



Mold Spores are Everywhere !

BLACK MOLD

—

YOUR HEALTH & YOUR HOME

by

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Fungi by Progy

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First Paperback Printing 2003

Library of Congress Cataloging in Publication Data
Progovitz, Richard F.
Black Mold – Your Health & Your Home

ISBN – TBD

Manufactured in the United States of America

Table of Contents

Introduction

1. Fungi
 2. Mold
 - History of Molds
 - Mold Requirements for Existence and Growth
 - Other Factors that Influence Mold Growth
 - Enemies of Mold
 - Mold Spores
 - Types of Common Molds, Mildew & Yeasts
 - How Molds Invade/Enter Our Bodies
 - How Molds Invade/Enter Our Homes
 - Health Related Symptoms Due to Molds
 - Sources of Indoor Moisture
 - Items/Materials That Can Become “Mold Food”
 - Mold Inspection
 - Mold Testing and Sampling
 - Protocol Plans for Mold Remediation
 - Mold Remediation
 - Mold Cleaning Equipment
 - Mold Prevention
 - Building a New Home with Mold in Mind
 - Mold in RVs, Travel Trailers and Campers
 - Federal, State and Local Laws, Regulations, & Guidelines on Mold
 - Questions to Make You Think About Mold
 3. Conclusion
 4. Summary
- Acknowledgements*
About the Author
References

Our Houses have become
Spore Banks!

Introduction

“Black Mold” has surfaced as the 21st Century's first Biological War in Homes to hit North America, and it's not all just hype. Mold is a real concern in our daily lives.

It is impossible to eliminate all Mold and Mold Spores inside a dwelling, but they can be minimized and controlled to a high degree. In fact, air pollutants can be eliminated to a high degree. People susceptible to Mold, especially immune compromised individuals (HIV infected), may relieve some of their health problems and symptoms by improving their Indoor Air Quality (IAQ).

There are estimated to be around 100,000 species of Fungi. Approximately 100 Species of Mold are toxic and about 15 are known to cause negative health effects in man and animals. Mold is only one factor that can affect IAQ. Other problem substances such as allergens, radon, asbestos, fiberglass, CO₂, and lead paint can cause many other health related issues, but these are not addressed in this book.

The source or cause of Mold must be inspected for and fixed immediately, within 24 to 48 hours of contamination. If not, airborne Mold Spores will have an opportunity to land on “Mold Food” and start multiplying at exponential rates. “Mold Food” is any substance that is needed by Mold Spores to germinate on, and for Mold to decompose and reproduce on. It makes no sense to clean up Mold you can see, without figuring out why it is growing there. Where is the source of moisture coming from? Removing the Mold's source of Mold Food is only one of the steps for a proper Mold Remediation. If you had, have now or

will have, any water problems indoors, keep reading: this book will give you most of the information the professionals have and use.

Our living habits are making Mold problems more prevalent. Mold problems are becoming an increasingly bigger threat due to house to house cross contamination of different Species of Molds. This happens many times, especially when moldy materials are being removed improperly and Mold Spores are allowed to go airborne. This can be dangerous to the neighbors' health and homes.

Is Mold, a product of "Mother Nature", providing a silent and mostly invisible to the naked eye, terroristic attack on humans, domestic animals and their dwellings?

This book has been written to aid an individual in determining if the air you breathe, Indoor Air Quality (IAQ), has the potential of harboring Toxic Molds and, if yes, what you can do about it. Mold is both a serious health threat to humans and a necessity for sustaining life on earth.

Chapter 1

Fungi

In 1729, Italian botanist Pier Antonio Micheli first published descriptions of Fungi. This was the birthplace of Mycology - the study of Fungi. Fungi were classified in the Plant Kingdom and a branch of Botany was developed.

Fungi then fell into the Classification under the "Kingdom of Fungi", the 5th Kingdom, which was established in the late 1950's and early 1960's. Fungi were then accepted by the world wide Scientific community, separating them from the "Plant Kingdom".

Fungi (plural of Fungus) are basically life forms that do not require sunlight (photosynthesis) to live, and require organic substances for nutrition. This is performed by the hyphae, which secretes acids and digestive enzymes around their food and they break down the surrounding organic material into simple molecules that are absorbable into their cells. They reproduce by the hyphae/mycelium colonizing and growing Spores. Spores are the "seeds" of a Fungus.

The following living organisms have fallen into the Kingdom of Fungi; Mushrooms, Truffles, Molds, Mildew, Rusts, Yeasts, Scab, Blight, Wilt, Blotch, Spot and Rot. Some are similar to each other and some of the names are often interchangeably used. It depends upon whom you are talking to, what you are reading or what you are watching/seeing as to the description used. The common homeowner and many others call Molds and Mildew, the same thing. Many people use the word Mildew in describing a smell, an odor, a

fungal growth, or a stain. So what is right and what is wrong? Even though an organism can have common names in many languages, it possesses only one scientific name, which is in Latin. This Latin name is unique, and it is only used once in science to describe an organism. A scientific name has two parts, the Genus (Genera pl.) name, and the Species name. There is no one Organization that defines the terminology. There are always new discussions on discoveries, and where to best classify what we had called a Fungus. Some Mycologists have moved Downy Molds, Slime Molds and Water Molds, also known as Oomycetes to the Kingdom Protista. Characteristics of these types of living organisms align them closer to amoebas. One reason is based upon these organisms' lacking chitin in their hyphae walls. Chitin is the same material that forms the exoskeletons, or the hard outer shells, of insects and other arthropods including moths and beetles. Plants cannot make chitin. Other Scientists propose moving Water and Downy Molds to a new classification into a separate "Kingdom of Stramenopila". This is just one example of the scientific juggling that goes on in the fungal world. Joining Mycological Associations such as NAMA (North American Mycological Association), NEMF (NorthEast Mycological Federation), MSA (the Mycological Society of America) or Local Mushroom Clubs, are good ways to get, and be, continually educated in the Fungal arena. Changes are constantly proposed and are being made.

For most people, it doesn't make much difference what terminology is used. To the homeowner, it is, and should become a greater concern, for many reasons. To the Scientific Community, the differences can mean much, in the

ability to classify Fungi, hopefully, in some way be for the good of humanity. Many changes have and are being made, as knowledge increases and commonalities and characteristics of taxonomy are being revisited. It can be very confusing, especially if your background is of the “Old School” or from the new 21st Century’s school of changes, in classifications. To many older amateur and professional mycologists, fungal name and classification changes are becoming understood and are slowly being accepted. As in any Science, knowledge is always the key to understanding, and then, that newly learned knowledge can be used to make changes, for the better.

All Fungi fall into one or more of the following four groups.

Symbiotic
Saprophytic
Parasitic
Terrestrial

Symbiotic - When a fungus has a symbiotic or mycorrhizal association with a particular plant, each party mutually benefits from the other. Neither one harms the other. Simply put, the fungus’ mycelium breaks down materials and supplies the plant with mineral nutrients it needs. The plant supplies the consistent moisture needed for the mycelium to grow, other carbohydrates and chemicals to the fungus that it cannot produce/manufacture.

Saprophytic - Fungal relationships in this classification receive nourishment from dead organic material such as starches and cellulose, by typically

decomposing wood, fallen branches, stumps and leaves. These are our forest floor cleaners. Where do you think the fallen leaves go? If it weren't for Fungi, the leaves would literally stack up and prevent the rain water from getting to the roots of all types of plants. This condition would not allow an equilibrium state of an eco-system that we enjoy. Many types of Molds fall into this category and can cause food spoilage, grow in aviation fuel or eat your house. In the past few years, the dreaded Black Mold has become the most notorious Saprophyte. Also, it has been historically documented that more British ships, during the American Revolution, were destroyed by Saprophytic Fungi, then by enemy attacks.

Parasitic - Fungi that fall under the classification of Parasitic, are destroyers of living organisms. Cancer is a parasite to the human body. The host material of a parasite can be anything from human tissue to a live Maple tree. Mushrooms, Molds, Mildew, Rusts, Yeasts, Scab, Blight, Wilt, Blotch, Spot and Rot fall into this category. A good example of this is *Armillaria mellea*, also called the Honey Mushroom or Oak Root Rot Fungus. When this Fungus' mycelium infests itself into a tree for instance, it literally eats the fibrous cellulose materials and leaves a powdery residue. The dried up powder are the remains of the digested wood, dried up mycelium, dormant Spores and other matter. When the substance is touched, it collapses and turns to a dust like form, and the dormant Spores disperse to find new Mold Food.

The Parasitic Club Lamb Fungus, also known as Ovine Ringworm, Lumpy Wool or Woolrot, is a Species in the Genus *Trichophyton*, that causes a disease in show sheep. Show sheep are frequently washed, which removes the lanolin from the wool and

skin. They are also frequently sheared, which contributes to the disease, for the wool and lanolin are removed. Trichophyton is the most contagious sheep fungus, and the links to solving the disease lies in the fact that a loss of lanolin, a natural sheep skin lubricant, allows the Fungus to find its Mold Food in cuts or bruises in an animals skin.

Terrestrial - Terra means earth. Fungi that fall into this category basically grow in soil. These Species, are just at like plants, they take in nutrients found in the soil. Their mycelium intertwines amongst the moist dirt, pebbles, rocks and the other materials and minerals found in the soil and sometimes produce a fruiting body, such as a Mushroom. Terrestrial Species really don't harm anything.

The following should clear up most of the differences between Fungal forms, by defining what each is, and examples of them.

Molds

Molds are living organisms that start to grow when an airborne Spore lands on moist Mold Food. In general, as a Mold Spore germinates, it grows hyphae/mycelium or roots, and they start multiplying and branching exponentially. As the hyphae branch in many fashions, they basically grow Spores. When the Spores go airborne or they get an opportunity to germinate, the process begins all over again.

The following are a few interesting facts about Mold:

- Mold digests food, then eats it. Man eats food and digests it. Mold creates and secretes

digestive enzymes, acids and other corrosives that break down (digest) food outside their bodies and then eats (absorbs/devours) the substrate through the hyphae's cell walls. After a period of time, the remains of Mold can be just dust.

- To date, Dust Mites are the only living creatures found, that eat Mold. Molds are basically not in the "Food Chain". Mold growth starts with tiny Mold Spores that germinate into hyphae or mycelium as it is known as in the fungal world. The hypha (hyphae - pl.) can grow rapidly when its airborne spores land on "Mold Food". Mold, like Slime Molds are full of decomposing enzymes which become slimy, moist and full of minute strands of fibrous growth.
- Hyphae are the tentacles or the roots of Mold and they eat solids. When the surface Mold is removed or cleaned, the Mold can and will return on many materials. This is due to the fact that its hyphae/roots were not all killed and many still remain imbedded into its host.
- If Mold lacks water or "Mold Food", it goes dormant, just waiting for the right conditions to start the ugly growth process all over again.
- Mold is considered to be "Slow Fire" and can become explosive quickly. The problem with Mold is that it only gets worst if nothing is done about it. Black Mold is a Biohazard that contains mycotoxins, and are carcinogenic. Carcinogens can cause cancer and are parasitic in nature. Parasites take what they want from a host and give back nothing in return. They are killers.

- Dead Mold left on surfaces is not good Mold. The dead Mold Spores of any toxic Mold still contain mycotoxins.
- All Mold must be removed or it will re-appear again.
- Mold does not need free standing water to grow. Moisture in the air is sufficient enough for Mold growth. A term named Water Activity (Aw) is the amount of moisture needed for Mold Spores to germinate. The Aw levels vary with different Species of Mold. A high Aw is 0.9 and a low Aw is 0.1.
- One square foot of Mold infested drywall can contain/produce more than a 1/4 million Mold Spores. There is no practical way to totally eliminate all Mold and Mold Spores indoors. However, Mold Spores can be drastically reduced in numbers by preventive maintenance and common sense. Eliminate all sources of moisture in the Home and you are on your way to better IAQ (Indoor air Quality).
- Mold Spores are “hitchhikers”. They cling to everything from our clothes to our pets. When we walk inside, Spores are released by air currents and will eventually land on something. If that something is “Mold Food”, and moisture is present then Mold will start growing.
- Multiple Species of Mold are attacking people on several fronts. This is probably the worst condition for the human body to resist. Antibodies can’t fight off everything unless we are in perfect health, which nobody is.
- An example of a good Mold is *Penicillium roqueforti*, which makes blue cheese. However,

other Molds in the genus *Penicillium* are not safe to eat and do not taste good.

- Soy Sauce is made from soybeans, which were fermented by an *Aspergillus* Mold.
- *Hormoconis resinae* is a Mold that grows in Aviation Fuel, Diesel Fuel, Gas, Lubricants, Oil, Hydraulic Fluids and Water. Everyone in the oil industry and its customers strive to prevent contamination of petroleum products and fuel tanks by microorganisms. Mold in these Fluids cause organic acids that can eat through metal parts, which is unacceptable in the Aviation Industry, as well as all others. A new quantitative colony test, similar to Culture Plate Testing (described later), has been developed for the detection and monitoring of microbial growth contaminations in oil products. The result gives an indication of the level of contamination, in a couple of days, after a growth period. Prior to this new testing method, the previous 30+ year old test produced a yes/no result, in minutes, but it only indicates that a fluid is contaminated.

Mildew, Rusts, Yeasts, Scab, Blight, Wilt, Blotch, Spot and Rot:

The differences between Mildew, Rusts, Yeasts, Scab, Blight, Wilt, Blotch, Spot and Rot vary in microscopic characteristic differences, DNA analysis, and to an individuals' description, whether it be by a professional or the common homeowner.

Yeasts multiply as single cells that divide by budding (ex. *Saccharomyces*) or direct division (ex. *Schizosaccharomyces*), or they rarely grow as simple

irregular hyphae (mycelium). In sexual reproduction most yeasts form asci, which contain up to eight haploid (single set of chromosomes, half the full set of genetic material) ascospores. These ascospores may fuse with adjoining nuclei and multiply through vegetative division, or as with certain yeasts, fuse with other ascospores.

Yeasts, are unicellular fungi that can be separated into two different types. One type is a non-invasive, sugar-fermenting organism, used to make bread dough's rise and for wine and beer fermentation. Yeasts are comprised of 50% protein and are sources for niacin, folic acids and B vitamins. The Yeast's function in baking is to ferment sugars present in the flour or added to the dough. This fermentation gives off carbon dioxide and ethanol. The carbon dioxide is trapped within tiny bubbles and results in the dough expanding, or rising. The other Yeast form, which is invasive, or parasitic in nature, produce long root-like mycelium structures, called rhizoids, that grow inside of Mold Food and destroy the host, in time, if conditions are right. When our bodies lose their proper immune protection, or the intestinal pH has changed unfavorably, Candida Yeast, which is present in the body at all times, can change from the Yeast form to the Fungal form. It has been unofficially estimated that approximately 80% of the US population may have candidiasis that is out of control! When this happens, the parasitic Fungal form penetrates the gastrointestinal mucosa and breaks down the boundary between the intestinal tract and the rest of the circulation in our bodies, thus causing digestive tract problems. However, there is an essential Yeast called the Gut Fungi, which lives in the gut of Cigar Beetles. The Yeast detoxifies the toxins in plant

materials that the Beetle eats, which in turn prevents the Beetle from being poisoned.

Yeasts cannot be classified as Molds because they lack true hyphae. However, they resemble Bacteria in their forming of slimy colonies of spore like cells. Their cells are 2µm or larger. Bacteria are minute spore like cells that are 1µm in diameter or less and never contain hyphae. An exotic Tea Mushroom called Kombucha is not made from a Mushroom at all. Kombucha is a symbiotic community of Bacteria and Yeasts living together in sugar, water and a tea mixture, which produces a vinegar like beverage. The beverage has become a fad and is claimed to have beneficial effects on gastrointestinal problems. The problem with home cultivation of Kombucha is contamination, which can in numerous ways, "spoil the brew", causing serious digestive problems in those that consume the drink.

Unlike Bacteria, Fungi are eukaryotes, their cells contain organelles such as nuclei, which are also found in plant and animal cells.

In the agricultural world, Wheat has an number of fungal diseases that affect its flowers, grains, heads, leaves, stalk and the plants' roots. Wheat is one of the most widely grown grains in the U.S. It along with other grasses are used to feed the world. Since 1993, Wheat and Barley production has suffered significant losses, due to fungal diseases. It has been estimated that from 1998 through the 2000 growing seasons, \$870 million was lost.

The U.S. Wheat and Barley Scab Initiative, whose mission is to stop Fusarium Head Blight (Scab) from damaging wheat and barley crops in the USA, meets each year to present and discuss the latest data and advances in controlling this Fungus. Every year,

almost 200 hundred Federal, State and Private Research Scientists, Biologists, Farmers and many others in the Agricultural field get together in the Mid West US, for an annual conference. The seriousness of our food sources and reserves being infected by Fungi is not being ignored and obviously it can't be.

The following are some examples of crop disease Fungi that affect Wheat:

Wheat - Seed and Head diseases

Scab (Head Blight) - *Fusarium graminearum* - When infected, Spikelets or Heads appear bleached, often with a pink tint, the kernels tombstone, they have light weighted seeds, sometimes infected heads are barren, and they can produce a mycotoxin. Also called Seedling Blight.

Septoria nodorum (*Leptosphaeria nodorum*), and leaf blotch: *S. tritici* (*Mycosphaerella graminicola*) - Yellow water-soaked flecks becoming dry, and then produce reddish brown lesions. *S. nodorum* lesions are round. *S. tritici* lesions are blocky with tiny black spots (pycnidia *Septoria Glume Blotch* - Leaf and Glume blotch:) that are visible in rows in the mature lesions.

Wheat - Leaf diseases

Tan Spot or Yellow Leaf Spot - *Helminthosporium tritici-repentis* - This Fungus turns the leaves tanish-brown, with spots on upper and lower leaf surfaces expanding to blotches 12 mm long, often with yellow borders. This Fungus produces fruiting bodies called pseudothecia and they are visible as dark raised specks on wheat straw.

Septoria Leaf Blotch - *Septoria nodorum* - Chlorotic (yellow) water-soaked blotches becoming dry, yellow, and then with red-brown lesions. *S. nodorum* lesions are round. *S. tritici* lesions are blocky with tiny black specks (pycnidia) visible in rows of mature lesions.

Powdery Mildew - *Erysiphe graminis* - White or gray-brown powdery or cottony patches of mycelium (fungal roots) on the upper surface of lower leaves. Tiny, brown-black specks (cleistothecia) are visible in older gray-brown areas. Yellowing is usually visible on the undersides of leaves opposite the powdery patches.

Leaf Rust - *Puccinia recondita* - Dry, yellow (chlorotic) flecks to red or brown-black necrotic spots on upper leaf surfaces.

Rhizoctonia Spring Blight - *Rhizoctonia cerealis* - Produces large, irregular lesions on dormant leaves. If plants are dormant or stressed after infection, the fungus may develop into crown tissue and plants may die. Severely infected plants fail to green-up in spring, or may be green for a short period and then die.

Wheat - Root diseases

Fusarium Foot Rot - *Fusarium* sp. - Also called Seedling Blight or Root Rot. Its crown and lower nodes turn brown.

Take-all - *Gaeumannomyces graminis* var. *tritici* - Infected plants appear mildly chlorotic and have fewer tillers. Severely infected plants are stunted, develop white (bleached) heads, and die prematurely. Roots are few, black, and brittle.

Imagine how many different Species of Fungi there must be, if the above examples are just some of the Wheat infections that are known to exist.

In the Rust Family, Uredinales, there are approximately 5000 known species in about 150 Genera.

In the Smut Family, Ustilaginales, there are approximately 1200 known species in about 50 Genera.

Another kind of Fungus that affects many kinds of plants is called Wilt. An example of this is the Fusarium Wilt, which affects potted Chrysanthemums flowers. Wilt can be any kind of drying up of leaves or flowers on plants. Researchers have found that extracts from hot peppers and cloves added to the soil of the potted plants stop the wilt from occurring. This type of research is on going for many different fungal problems in plants, grasses, vegetables, bushes, trees and other living organisms.

In the early 1900's a fungus called the Chestnut blight entered the US on imported Asian nursery stock. The American chestnut was highly susceptible because it was never exposed to this fungus. The fungus' Spores were rapidly spread by the wind, birds and other animals. The Spores entered the trees through wounds or cracks in the bark and it would destroy a tree in one growing season. The Blight wiped out billions of these trees, from Maine to Georgia, along the Appalachian Trail. The Chestnut tree never recovered.

Another example of a destructive Fungus is the Dutch Elm Disease. This Fungus gets under the bark and destroys the bond to the solid wood. The Fungus spreads rapidly throughout the tree and to neighboring trees with the help from beetles and other insects. The Spores hitchhike their way around on an insects body

and eventually they fall off and start to colonize somewhere else, other than where the Spore was picked up. The mycelium grows rapidly and starts the deteriorating process. The bark then falls off, and the tree dies early in its life. Most Elm trees grow up to about 8 inches in diameter, prior to this fungus killing it. Evidence of this disease is the pile of bark pieces around the base of the tree, which takes years to decompose. The disease was accidentally introduced into North America in the 1930's and continues today.

The following are examples of some trees and Fungal diseases that are Parasitic to them:

Maple Trees - Armillaria Root Diseases, Silver Leaf Disease, Brown Crumbly Rot, White Mottled Rot, Annosus Root and Butt Rot

Birch Trees - Armillaria Root Diseases, Silver Leaf Disease, White Spongy Trunk Rot, Brown Trunk Rot, Brown Cubical Sap Rot, Brown Crumbly Rot, White Mottled Rot, Sterile Conk Trunk Rot of Birch, Brown Cubical Rot, Nectria Canker, Stringy Butt Rot, Schweinitzii Butt Rot, Hardwood Trunk Rot and Red Ring Rot

Douglas Fir & Hemlocks - Dwarf Mistletoes, Armillaria Root Diseases, Silver Leaf Disease, White Spongy Trunk Rot, Brown Trunk Rot, Brown Cubical Sap Rot, Brown Crumbly Rot, Phomopsis Canker of Douglas-fir, Grey-Brown Sap Rot, Tomentosus Root Rot, Conifer -

Aspen Rust, Conifer - Cottonwood Rust and Rhizina Root Rot

Aspens - Cytospora Canker, Aspen and Poplar Leaf
and Twig Blight, Aspen Trunk Rot,
Marssonina Blight, Armillaria Root
Diseases, Silver Leaf Disease and other
Broadleaf Foliar Diseases

Many of the above tree diseases can infect different Species of trees. A good example of this is the Armillaria Root diseases, which infects many trees in its mycelium path of growth. The Armillaria Genus of this Fungi is the edible Species called the Honey Mushroom. Isn't it ironic that one organism can be a parasite to another organism, and other living organisms, like man, can eat the fruit of the parasite with no health problems.

Research is being conducted on some Species of White Rot Fungi, by the Canadian Department of Forestry, Universities, Institutes and Industry. The goal is to eliminate chlorine in the production of wood pulp by replacing the current unfriendly chemicals to a biological process, for the removal of lignin and other extractives in the wood.

Mushrooms

Mushrooms are quite different from the other Fungi, and almost everyone can relate to these types of fungal growths. There are more than 8,000 different Species of "Large Fungi" or Mushrooms defined. Mushrooms are the fruiting bodies of the underground mycelium network of many different kinds of Fungi. Mushrooms appear at various times of the year,

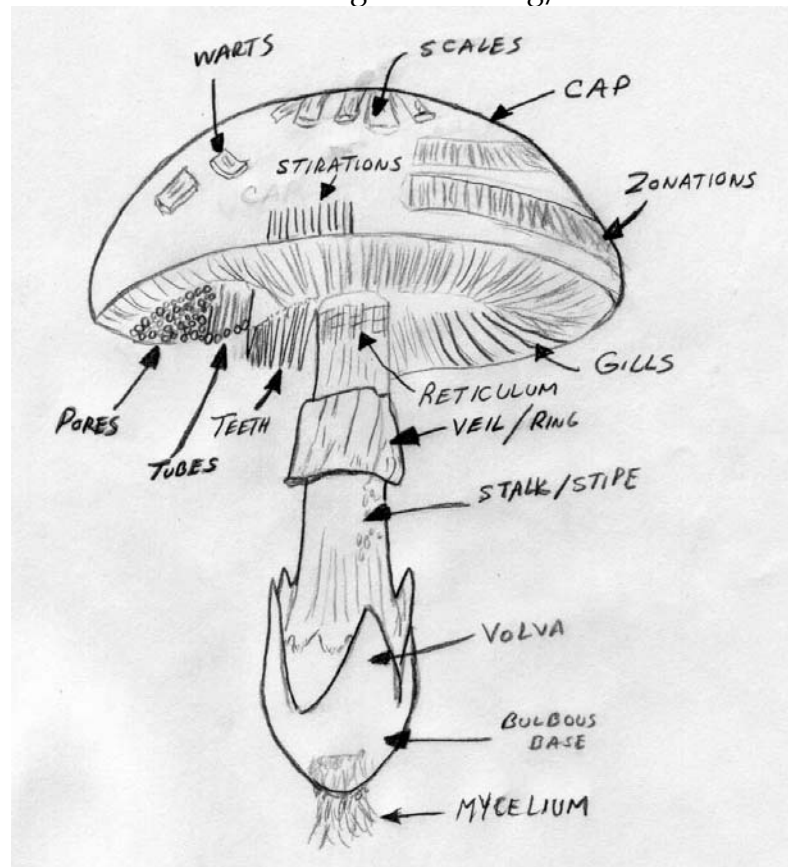
especially when the environmental conditions are right for the Species to again propagate. There are many estimates as to how many different Species of Fungi exist in the world. The number varies, conservatively, from 1 to 1.5 million Species. The number of known Species of Fungi is around 100,000. Based upon the Scientific estimates, man has a lot to learn and Mushrooms are just a very small part of the Kingdom of Fungi.

There are relatively few Poisonous Mushrooms compared to the number of non-Edibles and Edible Species that exist. Poisonous Mushrooms can make you mildly sick to causing your death. Most deaths occur from people picking and eating Mushrooms that they have mistaken for “look-a-likes”. Amanita phalloids or the Death Cap has been the biggest culprit for Mushroom related deaths. On the average, less than a dozen people die each year in the US from eating Poisonous Mushrooms. Even though one death is one too many, the odds of dying from eating Poisonous Mushrooms are one out of millions. Deadly Poisonous Mushrooms have characteristics that are easy to identify and to avoid. Mushrooms in the Genus of Amanita should be avoided. All it takes is a little knowledge, and some time spent, to become educated on their identifiable features.

The following are some basic Poisonous Mushroom characteristics that should throw up a red flag of *DANGER*, upon visual observation:

- All white Mushrooms.
- Mushrooms whose underside gills are white.
- Mushrooms whose underside gills are NOT attached or NOT touching its stalk.

- Mushrooms that have a ring/veil/skirt around the top half of the stem/stalk.
- Mushrooms that have green Spores.
- Mushrooms that have a wide/bulbous stalk at its base.
- Mushrooms that have a cup/volva at its base.
- Mushrooms that have warts/scales on the top of its cap.
- Mushrooms that are brightly colored or beautiful.
- Mushrooms that grow in dung/scat.



The following are some basic NO-NO'S on eating or picking wild Mushrooms:

- Never eat any wild Mushroom unless it has been positively identified. Get educated first by joining a Mushroom Club, surf the Internet and get some books to start with. Otherwise, stick to the store bought types, which can be found fresh, dehydrated, pickled or canned.
- Never eat more than one Species of Mushroom at one time. If there is an illness, it will be almost impossible to determine which Species caused the problem.
- Do not eat the same type of Mushrooms too many times in the same day or in consecutive days (day after day). An edible Mushroom called the Smooth Thimble Cap, *Verpa conica*, fruits in the springtime and can produce a Mushroom Poisoning due to its toxicity build up in a body's digestive system, over a short period of time.
- Never eat ANY Mushroom raw, not even the cultivated store bought White Button Mushrooms. Case studies are now showing that bacteria on the mushrooms are being diagnosed as deceivers in "Mushroom Poisonings". Imagine what happens when customers choose their mushrooms from open displays in stores. Sometimes they pick up a mushroom, look it over and put it back. Your hands pick up a lot of bacteria in a day. Washing off the mushrooms will not eradicate all of the bacteria. When a person prepares a salad with sliced raw mushrooms in it, they risk a chance of contracting a bacterial infection after eating it. Bacteria are like Fungal Spores for they are also

almost everywhere. Sometimes Mushrooms are taking a bad rap for mis-diagnosed “Mushroom Poisonings”. It isn’t necessarily the Mushroom that has caused the illness, it may have been a bacterial cause. It could be that the mushrooms were not thoroughly cooked.

- Do not use “O’l Wives Tales” to determine edibility. One of the most common fallacies is that Poisonous Mushrooms will turn a quarter or the water black when they are boiled together, after a minute or so. Don’t believe these types of identification techniques, they will get you in trouble! When in doubt, throw it out.

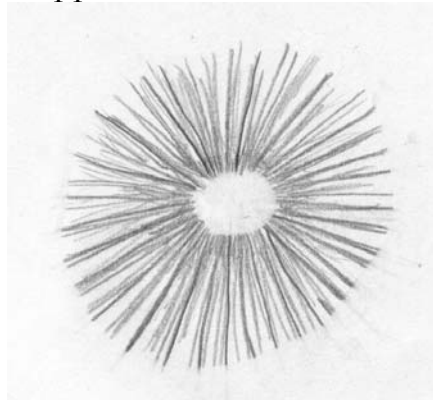
Non-Edible Mushrooms are Fungi that are not poisonous, but are not edible or palatable due to their tough texture, bad taste, foul smell or tiny size. There are many of these kinds of Mushrooms. In fact, Non-Edibles make up the vast majority of all Mushrooms. Even though these types of Mushrooms are not edible, many of them have other uses.

Besides the macro/visible characteristics of the physical Mushrooms that are used in the identification process (Cap, Gills, Stalk), the micro characteristics are truly what defines the specimen to a Species. In order to verify the Spore color, Spores must first be collected.

Taking a Spore Print: Spore color is one of the basic features used in the identification of agarics (gilled mushrooms) and is readily determined by taking a Spore Print.

The following describes how to take a Spore Print

1. Choose a Mushroom whose cap is freshly opened.
2. Cut the stem off a fresh cap close to the gills.
3. Place the cap, gill-side down, onto a piece of white/black colored paper. Sometimes it is advantageous to place a Mushroom Cap on two pieces of paper, $\frac{1}{2}$ white and $\frac{1}{2}$ black. This can give a better color contrast, Spore color against two opposite color backgrounds. Since the Spore color maybe unknown, a white Spore color on a white paper will not show up good, however a white Spore color on a black paper background will be obvious.
4. Cover the Mushroom Cap with a glass, cup or bowl, and leave it alone.
5. After 24 to 36 hours, carefully remove the cover and lift up the Mushroom cap off the paper. If the Mushroom was a mature Specimen, and you have eliminated air currents by covering it up, you should get a good print that shows a radiating pattern of thousands of Spores that have dropped



Typical Spore Print from a gilled Mushroom

There is no one-way to differentiate the various forms of Fungi easily, except for Mushrooms, for they have distinguishable macro characteristics, that are visible with our eyes or with a magnifying glass. However, it can also be very difficult to identify a Mushroom to a Species. Again, like Molds, microscopic characteristics are the key to positive identification of Fungi. Mycology is a Science, the study of Fungi, and we have only seen the tip of the iceberg.

The following quote describes an analogy between a fruit and its host ;

**“The Apple is the fruit of the Apple Tree,
the Mushroom is the fruit of the Mycelium,
Spores are the fruit of Mold,
and Beer is the fruit of Yeast !”**

History of Molds

The History of Molds has been documented as far back as ancient Egyptian times and in the Old Testament of the Bible. The Egyptian hieroglyphics defined curses on invaders of their sacred tombs and burial places. Many of the “grave robbers” and Archeologists who first entered and worked there, inhaled the musty air inside the tombs and many died of suspicious circumstances, including respiratory related problems. The story told of those who entered King Tut’s tomb reported that confined air was “thick and pungent”. Was this Mold related?

In the Old Testament of the Bible, there are several references to Fungi. Mold was written about and considered to be the leprosy of clothes and the leprosy of houses. There are many translations and versions of the Bible and the Old Testament. The references used here, are from “The Book”, a special edition of “The Living Bible”. The verses about Mold do a pretty good job of briefly describing Mold problems over 2000 years ago, and how to remedy those problems.

Leviticus, Chapter 13:47-59 states:

“If leprosy is suspected in a woolen or linen garment or fabric, or in a piece of leather or leather-work, and there is a greenish or reddish spot in it, it is probably leprosy, and must be taken to the priest to be examined. The priest will put it away for seven days and look at it again on the seventh day. If the spot has spread, it is a contagious leprosy, and he must burn the clothing, fabric, linen or woolen covering, or leather article, for it is contagious and must be destroyed by fire.

But if when he examines it again on the seventh day the spot has not spread, the priest shall order the suspected article to be washed, then isolated for seven more days. If after that time the spot has not changed its color, even though it has not spread, it is leprosy and shall be burned, for the article is infected through and through. But if the priest sees that the spot has faded after the washing, then he shall cut it out from the garment or leather goods or whatever it is in. However, if it then reappears, it is leprosy and he must burn it. But if after washing, if there is no further trouble, it can be put back into service after another washing. These are the regulations concerning leprosy in a garment or anything made of skin or leather, indicating whether to pronounce it leprous or not."

Leviticus 14:33 - 14:57 states:

"Then the Lord said to Moses and Aaron, When you arrive in the land of Canaan which I have given you, and I place leprosy in some house there, then the owner of the house shall come and report to the priest. 'It seems to me that there may be leprosy in my house!'" "The priest shall order the house to be emptied before he examined it, so that everything in the house will not be declared contaminated if he decides that there is leprosy there. If he finds greenish or reddish streaks in the walls of the house, which seem to be beneath the surface of the wall, he shall close up the house for seven days, and return the seventh day to look at it again. If the spots have spread in the wall, then the priest shall order the removal of the spotted section of wall, and the material must be thrown into a defiled place outside the city. Then he shall order the inside walls of the house scraped thoroughly, and the scrapings dumped in a defiled place outside the city. Other

stones shall be brought to replace those that have been removed, new mortar used, and the house replastered.”
“But if the spots appear again, the priest shall come again and look, and if he sees that the spots have spread, it is leprosy, and the house is defiled. Then he shall order the destruction of the house - all its stones, timbers and mortar shall be carried out of the city to a defiled place. Anyone entering the house while it is closed shall be defiled until evening. Anyone who lies down or eats in the house shall wash his clothing.”

“But if, when the priest comes again to look, the spots have not reappeared after the fresh plastering, then he will pronounce the house cleansed, and declared the leprosy gone. He shall also perform the ceremony of cleansing, using two birds, cedar wood, scarlet thread, and hyssop branches. He shall kill one of the birds over fresh water in an earthenware bowl, and dip the cedar wood, hyssop branch, and scarlet thread, as well as the living bird, into the blood of the bird that was killed over the fresh water, and shall sprinkle the house seven times. In this way the house shall be cleansed. Then he shall let the live bird fly away into an open field outside the city. This is the method for making atonement for the house and cleansing it.”

“These, then are the laws concerning the various places where leprosy may appear: in a garment or in a house, or in any swelling in one’s skin, or a scab from a burn, or a bright spot. In this way you will know whether or not it is actually leprosy. That is why these laws are given.”

To summarize, leprosy on clothes and in homes is Mold. The priest was the expert on cleanliness; Mold is unclean and considered leprosy. They understood back then that Mold is a horrible invasion of the body

as well as of clothes and dwellings. Mold had to be inspected for, a plan was devised and defined for remediation and finally, execution of the plan to repair and dispose of the Mold infested objects and areas were carried out. There is even a reference of cleaning things twice. Not much has changed!

In 1837, *Stachybotrys atra*, found on wallpaper in a home in Prague, Eastern Europe was described by a biologist named Conda.

Toxic effects of *Stachybotrys atra* have been reported as early as the 1920's.

In the 1930's in the Ukraine, *Stachybotrys chartarum* was deemed responsible for a disease in horses and other farm animals. Mold growing on straw and grain was fed to the animals.

In the 1940's, in Russia, *Stachybotryocosis* was diagnosed in humans. The farmers were in constant contact with mold infested grains.

Houses built in the 1960's to the present, with many energy conservation building materials & methods used, are actually starting to be recognized as Mold problem houses. These houses were sealed for air tightness (energy savings) and the indoor atmosphere has become stagnant inside, no air drafts. This along with a source of moisture and 'Mold Food' will incubate Spores and grow Molds.

From 1986 to the present, numerous accounts of *Stachybotryocosis* were reported in horses in North America.

In 1993 the New York City Department of Health convened a panel of experts to study Mold in indoor environments. "Guidelines" were issued in 1994 and updated in April 2000. Copies are available through the NYC Department of Health.

Currently, the label of “Black Mold” and its association with mycotoxins, is sparking much concern, uncertainty, hysteria, paranoia, litigation, insurance claims, news coverage and health related problems, questions and concerns. The seriousness of Mold infestations must be understood. The myths must be put to bed and the truths must be faced with optimism in defeating indoor Mold, and in diminishing the number of Spores to within acceptable levels. But what are acceptable levels?

Mold has become the 21st Century’s “most expensive game” in the Real Estate world, and it won’t stop. Mold is surfacing as the toughest and most vicious enemy of man.

Minnesota is also looking into Mold standards, but no date for legislation is set.

On July 1, 2003, California is to have a bill written to set guidelines and standards for Mold. What will they be? If the guidelines are not scientifically and medically correct, or vague, or not thorough enough and not strictly defined, then this poor example will set the trend and these standards will spread throughout the U.S. and be practically worthless.

The following are the latest guidelines and practices that Mold experts, who believe that “no indoor Mold is Good Mold”, feel are needed in the Real Estate industry as related to Mold. Typically, the industry sets the initial standards involving technologies and techniques for resolving new problems. The following principles listed are backed by medical and scientific proof, with politics kept outside of the “equation”.

- ✓ Mold Testing Methods must be the right type, which is both viable and non viable methodologies.

Each test must be defined, have a real purpose, be consistent in its results and must be repeatable. These methods should become the basis in Mold infestation diagnosis (both in health and home), remediation, litigation and accepted as the “Mold Testing Standards”.

- ✓ Mold Testing equipment, tools and kits must be standardized and defined to show their purpose. Calibration techniques must be defined along with testing times and testing methods used.
- ✓ Full body protection must be standardized. From head to toe, protective clothing standards must be defined as to its resistance to Mold Spore size, inhalation, ingestion, or clothing penetration limits.
- ✓ The Proper chemicals must be defined for killing both Mold, and Mold Spores. Bleach is not the cure-all to kill Mold and Mold Spores. Fungicides and Sporicides must all have ASTM documentation to support their effectiveness in killing Mold and Mold Spores and also in the prevention of future Mold.
- ✓ Proper Protocol Plans must be defined for various situations. Protocol Plans must be generated by qualified Mold experts. Strict guidelines, similar to what the military requires in their manufacturability of products by qualified suppliers in an assembly process, must be defined. These formal Plans must be as fool-proof as possible, with built-in redundancies, including follow-up testing.

- ✓ The Remediation process must be defined in order to follow the proper Protocol Plan. This must be confirmed by an independent auditor in high profile cases or serious infestations.
- ✓ All Mold Inspectors must be Certified through Nationally accepted Institutions. A roster of qualified Instructors and their Companies must be listed.
- ✓ Erring on the side of safety or overkill should be the accepted theme for Mold related issues.
- ✓ New Buildings must have standards and guidelines set forth in their construction techniques with Mold prevention in mind. This is especially true in high flood prone areas. Mold prevention should become a standard practice on new home construction. Landscaping, foundation, framing of treated wood, plumbing, roof, finish carpentry and layout should be seriously considered if a Mold-free environment is required.
- ✓ Real Estate transactions must have a standardized Water Damage and Mold Form defined that must be properly filled out and presented at the "Closing".
- ✓ Medical testing for Mold allergens must be analyzed along with Home Inspection results to make logical decisions on the correct Protocol Plan and Remediation Methodology to be followed. The facts must be presented to some type of decision-making Committee with basic truths and scientific

guidelines to enforce the Codes that have been defined.

- ✓ Mold Testing Laboratories must conform to a set of “Standards” in their analysis and methods of testing.
- ✓ All products that are promoted or labeled in any sense in claiming to kill, remove or prevent Mold or Mold Spores in any fashion must be verified and tested by common standards and by Certified Laboratories or an Environmental Agency.
- ✓ Disposal techniques and cleanup materials must be defined for the removal and transportation of the infected materials. However, landfills should be noted as places where Mold is doing its naturally defined job. By breaking down the materials that can be decomposed, Mold is performing its precise duty. Transporting the infected materials from the dwelling to the landfill is where the real Spore spreading problem exists. All Mold Spores, within reason, should be killed prior to the infected materials being removed, bagged and transported.
- ✓ Liabilities, fines, responsibilities, and guidelines must be defined for all parties involved in Mold situations. These guidelines must be based upon why the Mold grew, the size of infestations, the owners and insurance companies’ reaction times.

Mold Requirements for Existence and Growth

Molds need the following basics to grow:

1. Water or a source of moisture (this can be anything from a sweating water pipe to flooded conditions).
2. Oxygen (found in the air we breathe)
3. A source of “Mold Food” or nutrition (wood based, cotton and leather products are all ideal as nutrients for Mold growth).
4. Relative Humidity (RH) at approximately 50% or higher. RH Indicators (analog/dial gauge or digital LED displays) can be purchased (\$20 to \$200+, depending upon your budget) for use in rooms/areas (i.e., basements, bathrooms and kitchens) to act as a “dipstick” to read/monitor moisture levels in that environment. Home “Weather Centers/Stations” usually have a thermometer, barometer and an RH meter built into a single unit that is to be placed on a shelf or hung on a wall.
5. Temperature: Mold Spores can germinate from above 32 to around 120 deg. F. The ideal temperature range for Mold growth is 70 to 90 deg. F. Mold Spores will go into a dormant stage at temperatures below 32 and above 120 deg. F.

Other Factors that Influence Mold Growth

The following conditions can increase Mold growth exponentially:

1. Stagnant air provides an added boost to Mold growth by providing a stable micro-environment. Ventilation in the form of fans, open windows (depending upon the Season, and outside weather conditions), dehumidifiers and air conditioners work well, but only as preventive measures. Circulating air, in a sense, is a disinfectant for Mold, for it can reduce the airborne Spore count in a given volume of air.
2. Air tight structures (Homes, Offices, etc...) that were specifically designed to conserve energy can adversely affect IAQ. These dwellings are prone to harboring ideal conditions for Mold growth.
3. Damp areas left unclean and wet products (towels, rags, etc...) left indoors on concrete floors and in corners of rooms for two days or more can have the potential for germinating Mold Spores and causing Mold to grow. Check your kids' rooms!
4. Mold infested areas that were not completely cleaned or improperly cleaned and not properly Remediated, can have the same problem reoccur in a short period of time.
5. Mold grows quicker in low amounts of Nitrogen concentrations in the air or in the soil.

Enemies of Mold

Mold is one of man's oldest enemies, but we have coped with it for many centuries. Today Mold has taken on a new face that is threatening our daily lives. Even though Mold has survived for millions of years, it does have its weaknesses. If it weren't for "Mother Nature" the Mold relationship would have gotten out of control. However, the sun, wind and rain all play integral parts in the life of Mold and Mold Spores.

The following are items that have a negative influence on Mold Spores and Molds:

- ❖ Borax - One of the best natural enemies of Mold is Borax. Borax comes from Borate mines, and these are some of the few places on earth that Mold will not grow. Isn't it strange that one of the oldest laundry detergents sold, is one of the best products for killing Mold and Mold Spores without having poisonous side effects to humans? Borax is a fungicide. A typical Borax solution, 1 cup of Borax to 1 gallon of distilled water, can be used on many Mold infested items, without damaging them. Distilled water is pure, it contains no contaminants, bacteria or other particulates, and will help the dissolved chemicals penetrate deeper into porous surfaces. Avoid using tap water. It is necessary to filter out large, undissolved Borax particles by using cheese cloth, if you will use the solution in a spray bottle.
- ❖ Fungicides such as those that list ingredients such as Benzalkonium chloride or groups of

chemicals called "quats" (quaternary ammoniums) are extremely effective killers of Mold. Other ingredients to look for are Di-n-alkyl dimethyl ammonium chloride or N-alkyl dimethyl benzyl ammonium chloride. Read the labels on the products prior to purchasing them. Don't buy something that won't work or doesn't work effectively.

❖ Antimicrobial chemicals that list metallic oxides or borax as ingredients work great for Mold prevention. These products are like white paint and can be sprayed directly on lumber. They are good Mold killers and also are great for the prevention of termites, carpenter ants. Metallic oxides are even strong fire retardants. They are usually good for at least 10 years.

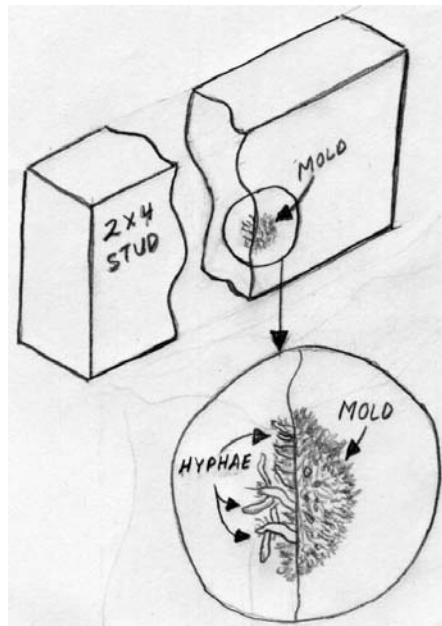
❖ Salt can kill Mold. Biologists in Laboratories pour salt over growing Mold in Culture Plates, seal them up with tape along the edges and dispose of the petri dishes in the garbage. Salt is not used to remove Mold from walls as a disinfectant. A strong chemical concentration is necessary to kill Mold and diluted salt water cannot provide that concentration effectively.

❖ UV Light does kill Mold and Mold Spores. This can come in the form of direct sunlight to special high wattage UV bulbs strategically located in an infected area. Hospitals use this technique to clean contaminated rooms. Placing Mold infected items in the sun for a few hours can also kill Mold and Mold Spores, but not effectively. Direct Sun contact on a Spore must be made for a long period of time.

There are products on the market that hook up to heating/cooling forced air systems and will kill Mold Spores as they float by the section with the lights. It requires a substantial amount of micro watts of power to do an effective job. An effective unit can cost a thousand dollars or more, depending upon the size of the system required.

- ❖ This is not an endorsement to smoking in your house, but homeowners who smoke tobacco products in the house generally have a small number of Mold Spores in air samples taken. Ironically, smoking indoors is a no-no for obvious reasons, but the smoke film that is left on all of the household objects is also a carcinogen to Mold and Mold Spores. Ironically, something like tobacco smoke has both good and bad effects on man, depending upon how you look at it.
- ❖ Dry indoor conditions can keep Mold Spores from germinating. Eliminate all moisture problems and your home is going in the right direction for IAQ control.
- ❖ Air circulation in houses, especially basements and crawl spaces is one of the keys to reducing and eliminating Mold from infecting your living spaces. This natural phenomenon, the wind, is a natural Mold disinfectant, in a sense.
- ❖ High Nitrogen count fertilizers are good in controlling Mold growth on garlic and onions.
- ❖ Other biocides that kill Molds are; isopropyl alcohol, hydrogen peroxide (3%) and vinegar.

❖ Common household bleach can kill Mold and Mold Spores but when diluted its concentration level is diminished to a point of ineffectiveness. Using bleach full strength can be hazardous to your health, especially when there is no ventilation and is also not an acceptable cleanup practice by OSHA. Bleach is a disinfectant and can be used on smooth surfaces, but not on cellulose based products, it doesn't penetrate into porous surfaces.



This sketch shows how a Molds' hyphae penetrates wood. If the hyphae are not killed, the Mold will return. Bleach does not penetrate deep into wood.

Spores

Mycologists have divided the Kingdom Fungi into five Phyla (or Phylum), which are classified by the type of Spores and how their fruiting bodies are produced.

The five Phyla are:

Ascomycetes – These Sac Fungi make up the largest group of fungi. There are approximately 50,000 known Species. The Spores are usually roundish or cylindrical in shape, and 95% of ascospores have 8 Spores per sac. Ascospores have an odd number of cells per Spore, example. 1, 3, 7 etc. These types of Spores do not have any tips on their outer structure and are not attached to anything inside the sac. Sexual Spores are produced from hyphae extensions in a sac-like cocoon, usually in groups of four or eight. This group includes Fungi such as Morel Mushrooms, Yeasts, Lichens, Truffles, Cup Fungi, Molds and some Powdery Mildews.

Basidiomycetes – These Club Fungi comprise of approximately 25,000 known Species. Their Spores, called basidiospores, grow from club shaped basidia growths. The tail or tip on these one-celled Spores is the hookup point to the basidium. A good analogy of Spores in this class is like how cherries grow on a cherry tree: multiple cherries in a group, originating from one common area. Basidia cling from the gills of highly desired/edible mushrooms such as Boletes and Chanterelles. This group also includes Fungi such as Boletes, Puffballs, Bird's Nest, Bracket, Shelf and Jelly Fungi, Corn Smut, many Saprophytes, Amanita's, and Rusts which can invade cereal grasses, other

agricultural crops and forest trees. Giant Puffballs can produce an estimated 7 trillion Spores per Mushroom. Spores in this Subdivision are dispersed into the air when a drop of water hits them. It has been estimated that one large raindrop on a mature mushroom can get a million Spores airborne.

Chytridomycetes - These aquatic Fungi have approximately 800 known Species in their Class. They are called Chytrids and they develop sporangium structures that are equipped with a whip-like tail for mobility. They are Saprophytes, and feed on guts of herbivores, and are also parasites on plants and animals.

Deuteromycetes - These Imperfect Fungi comprise of approximately 25,000 known Species. Imperfect Fungi typically reproduce asexually with Spores called conidia on hyphae called conidiophores. Examples of Fungi in this Class include good Molds from which the antibiotic Penicillium was developed, and bad Molds from where Ringworm, a plant and animal infection comes from.

Zygomycetes or Mitosporic - These Terrestrial Fungi comprise of approximately 900 known Species. They can be a combination of Basidiomycete and Ascomycete Spore generators which have an attachment to a hypha. Their thick walled Spores called Zygospores reproduce sexually and represent Species in three of the four different types of Fungi; Saprophytic, Symbiotic and Parasitic. Molds that fall into this Class play an important role as decomposers and are increasingly being used as a tool in cleaning the environment. Fungi are mixed with polluted soil

and water, and are used in bioremediation, to detoxify the pollution.

Mold Spores are the seeds of Mold. They are very small, and can be viewed under a good microscope capable of 400X magnification or greater. Mold Spores can vary in size, approximately, from 1 to 20 μm (micro-meters) in diameter and 2 to 40 μm in length. Micro-meters (μm) is the replacement term for "microns", which is 1 millionth of a meter, or 1/25,000th of an inch or 1×10^{-6} power. Our eyes can only see particulates that are larger than approximately 45 μm . Only a few Molds produce Spores as small as 1 μm in diameter. Spores of this size practically float in the air forever and are very difficult to filter out of indoor air.

Mold Spores are tough organisms. They have been found inside volcanic amber, removed and cultured (grown) after 1/2 million years of dormancy. Spores can survive very high heat. Boiling water will not kill all Spores. Steam will not kill all Spores. Freezing will only put Spores in a state of dormancy.

Growing Mold Spores or Molds are prepared on slides and examined under a microscope by professionals to determine its Genus and Species. This standard technique is used for Viable testing in all first class Laboratories.

When performing a gravity test for Mold Spores, 2-5 Spores per room, collected in a Petri Dish sample, in a 15 minute time frame, could be a low level Spore count. Ten Spores or more in the identical test, is proof enough of a high Mold Spore count and it is time to take action, especially if the outdoor Spore count was 5 Colonie Forming Units, that germinated in the Dish.

Cobwebs are a great place for Mold Spores to be found. As Spores float around, air currents can guide a Spore into the cobweb and it then becomes attached to the spiders' sticky silk threads.

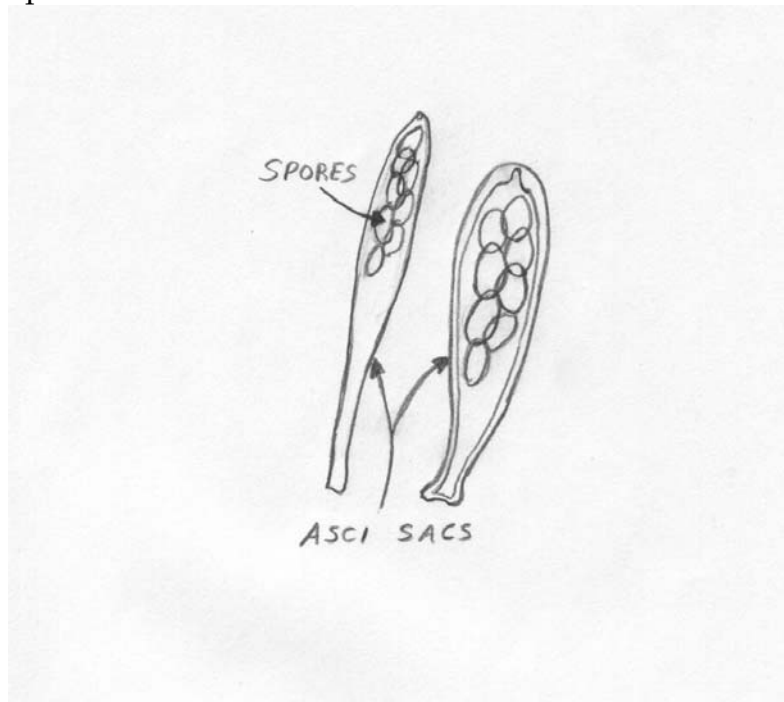
Mold Spores exist everywhere, even in Borate and Salt mines. However, Mold will not grow in these places. When Spores land on a moist area in these mines, the Spores will not grow.

Mold Spores are good "hitchhikers" and are carried into our homes every time we enter a building. Our shoes are notorious carriers of Spores. Maybe the Japanese custom of shoe removal prior to entering a house, has a hidden reason, or has that aspect of Mold been known in that part of the world for centuries?

The following is an example of a Basidiomycete fungus Spore growth. The picture is a side view of a gill, from an edible Blewit Mushroom, at high magnification.

Pic #

The following is an example of a Asciomycete fungus Spore growth. This sketch shows Ascii Sacs with Spores in them.

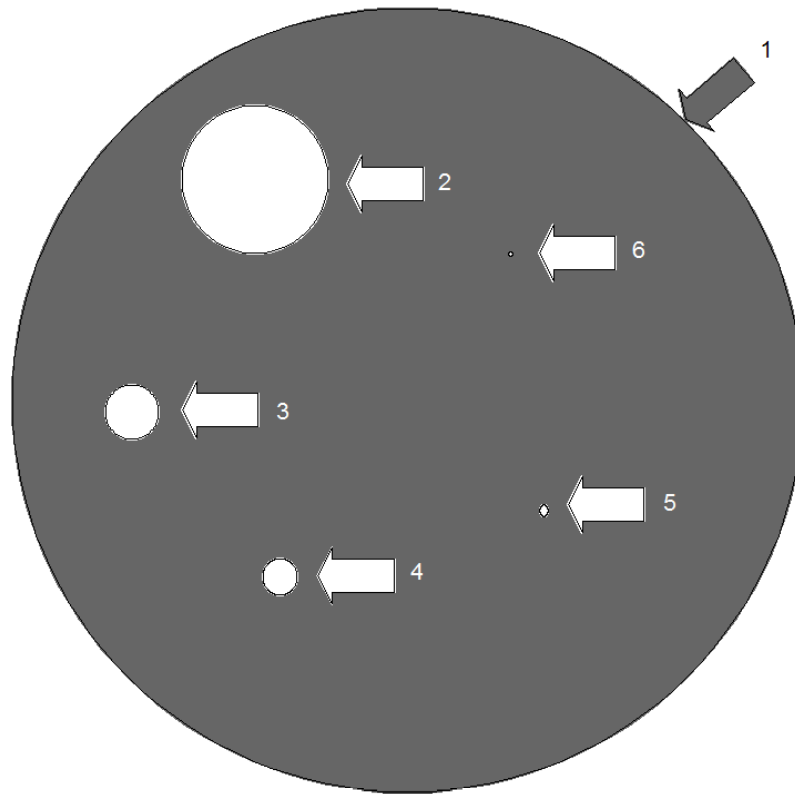


As the sacs grow, the Spores are then released through the top of the sac.

The size of a Mold Spore in relationship to other tiny objects.

Key to object size (not to scale, the diameters are in microns or 1 millionth of a meter or *um*):

- 1 - Average size of a Rain drop - 600 to 10,000 microns
- 2 - Plant Spore (Ferns) - 10 to 80 microns (approx. 45 micron sized particulates can be seen with our eyes)
- 3 - Mold Spore - 2 to 30 microns
- 4 - Bacteria - 3 to 5 microns
- 5 - Tobacco Smoke - 0.1 to 0.15 microns
- 6 - Viruses - 0.003 to 0.05 microns



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Types of Common Molds, Mildew & Yeasts

The following Fungi are primarily an overview of the most common types of indoor Molds that can be found in dwellings in North America. Most of the Molds can also be found outdoors under the right conditions. The Molds are listed as Fungi in their Genus. In some cases the Species will be noted, but there are just too many to list.

1. **Stachybotrys** - (pronounced stack-ee-bot-ris) - "BLACK MOLD" - This is one of the most dreaded types of Toxic Mold for a Homeowner to be told he has. The Spores in this family of Molds are less airborne than most other types of Molds. Even if these tough Molds are killed, the remaining 'dead' Spores have the toxins contained in them and are still dangerous. If the Spores become airborne, people can inhale them and health problems can propagate. This is one primary reason why proper Remediation of a Mold infestation is crucial. The color of Stachybotrys species of Molds can vary from a yellow-greenish, to a brown or to blackish hues. There are approximately 200 different mycotoxins in this Genus. However the study of mycotoxins is still in its infancy and many more species are waiting to be discovered. Mycotoxins can be carcinogenic and affect the liver, kidneys and basic cellular functions. Some of these toxins can contaminate grains and are heat stable, they can survive cooking. Species in this Genus basically feed on cellulose-based Mold Food to live and grow. However, cotton products, basic paints, leather and

other products will also permit the growth of *Stachybotrys*. Many other Molds in other Genus will also feed on the same Mold Foods. Spores in this Genus take 48 hours or more, after inoculation into an agar growing medium, to germinate. Other Molds grow much quicker, often within 48 hours after inoculation. *Stachybotrys* is usually not found when performing a Gravity Test in a Culture Plate.

2. **Aspergillus** - There are at least 15 known species in this Genus that have been found in homes and in offices. These types of Molds are commonly Saprophytic in nature, that is, they are feeders of decaying "Mold Food" such as wood, vegetables, plants, animal feed products and most any organic substrate. Some species contain toxins which are carcinogenic to humans and animals. Many people test positive and have allergic reactions with this Genus. Two species, *A. fumigatus* and *A. niger* which are thermal tolerant Molds, are pathogenic to humans. Some species can cause a life-threatening generalized infection called Aspergillosis or 'Mushroom Worker's Lung Disease'. *Aspergillus flavus* is a yellow-green Mold, which produces deadly mycotoxins and attacks peanuts and other seeds that are high in oil, stored in hot and damp areas. This species is also reported to cause permanent lung damage called fibrosis. Spores in this Genus are in the 2.5 micron size and are so light in weight, that they can ride the air without settling down to earth for long periods of time. The Spore color in this Genus varies from species to species and from host to host. An *Aspergillus* species named *A. niger* is black mold on onions and garlic. It appears macroscopically (visually) as a blackening on onion and garlic necks and as spots or streaks beneath the

outer layers of skin. They also show up as a black discoloration in bruised areas of the bulbs. Eventually the bulb shrivels up and turns blackish. Avoid wounding bulbs during harvesting, transportation and storage. Store bulbs in ventilated areas, in a lower temperature (33 to 55 deg. F) and in a dry environment, not a freezable area. *A. niger* has been commercially cultured for its ability to produce citric acid. Citric acid is extracted from lemon juice, is now made more profitably from this Mold, a benefit to man. This however is a very dangerous Mold and many precautions must be taken to avoid inhalation of the toxic Spores.

3. **Penicillium** - The common name of this fungus is 'The Bluish Green Mold', however the Mold colors may sometimes vary from white to yellow or red. The Spores are minute, 2 to 4 microns in diameter and proliferate on human foods such as cheeses, fruits and stored grains. Good hygienic practices should be followed to prevent this Species from propagating throughout your food. Many Species prefer an acid pH for growth. Laboratories have been growing a species named *Penicillium chrysogenum* in this Genus, and it has become a household word for many generations as the most common antibiotic. The discovery of an excreted fluid in the Mold, was discovered by Dr. Alexander Fleming in the late 1920's. Due to the fact of over-prescribing this antibiotic by physicians, many resistant strains of bacteria have evolved that resist treatment of *Penicillium*. These 'good' Molds are not present as a common indoor Fungus. However, most species in this Genus can cause allergic reactions to susceptible individuals. Identifying these types of Molds under a microscope, to a specific species is

difficult, even to a trained professional. *Cladosporium* and *Aspergillus* are similar in appearance to *Penicillium* Molds. This Genus is an imperfect fungus whose sexual reproduction is unknown in many species. They produce vegetative spores genetically identical to the parent. *Penicillium* is also commonly found in carpets and wallpaper. A high spore count inside the house is generally traceable to decomposing of human foods which often remain unnoticed by the owners, until a good housecleaning in the kitchen is performed. Over 125 species of Mold in this Genus are known to man and they were already identified by 1949. The Latin root of *Penicillium* means 'a brush-like tuft of hairs', referring to the sporulating structure characteristic of the fruiting body, or how a spore's hyphae grows. Under a microscope, *Penicillium* Mold growth resembles a toilet brush, with extended bowling pin shaped bristles. The spores are located at the tips of the bristles, and they are joined at their base to the top of a straight stick-like hyphae.

4. **Cladosporium** - The common name for species in this genera are called 'The Dark Green Mold', but can be blackish in color with age. The Spore size varies from 2 to 8 microns in diameter and 20 microns in length, dependent upon the species. The Spores (or conidia, as Mycologists refer to them) are not round, but elongated, semi oval, lemon or cylindrically shaped and blunt tipped where attached to the hyphae. The Spores can be one or two celled organisms, growing from the swollen ends of the hyphae (or conidiophores in Mycological terms). The Molds in this Genus are both saprophytic and parasitic in nature. They break down dead materials and can also be a cancerous to living organisms. *Cladosporium* is not as common as

Aspergillus and Penicillium, and it resembles the powdery Penicillium type of Molds. This complex of species is found in great numbers outdoors, but also thrives indoors in shower stalls, on other materials in damp places and in air supply ducts. Almost every bathtub and/or shower stall has, had or will have Mold growing in its corners, crevices and in the grout and on soap scum at one time or another, between cleanings. There are many household cleaners, including the standard borax and water solution (1 cup of borax to 1 gal. of water) that can be used to kill and control Mold growth in very moist areas. A Ventilation fan in the bathroom, preferably in the shower/bathtub area will dry the area out faster and reduce the potential for Mold growth. Fungi in this Genus are associated with Asthma related health problems. Over 150 species have been described by Mycologists. In a two year study, back in 1959, a Biologist named Kramer exposed agar plates to outside air and found that of all airborne sporadic activity, Cladosporium represented about 45% of the total spores recorded, which is the most predominant Genus of all airborne contaminants. A species named C. herbarum has been found in timber, logs and wood pulp products. Another species in this Genus, C. resinae lives on creosote and petroleum products including petroleum jelly used to grease seals on pressure cookers. The species C. fulvum attacks the leaves of tomato plants yielding colonies of the fungus that appear as brown to violet in color.

5. **Fusarium** - This Genus produces fast growing, white cottony mycelium (a colony of hyphae) at first, then turn various colors, per species, on grains from yellow to pink to purple. There are species within this Genus

that are highly toxic. Species such as *F. sporothrichioides* and *F. poae* produce potent trichothecene toxins. *F. graminearum* is one of the first living organisms to have been granted a Patent. History has recorded this Mold as being responsible for the deaths of approximately 30,000 people in the 1940s, during World War II. A province in the Soviet Union was plagued with Mold infected bread, made from poorly winterized grain. In the Ukraine, it has been dubbed as the 'Staggering Sickness'. Symptoms were flu-like, with nasal bleeding and vertigo. This fungus has been an interest to the Military since the 1980's. Back then the United States Government accused the Soviet Union of starting a new biochemical warfare methodology. These Molds can be controlled by decreasing humidity levels and increasing ventilation of an area. These Molds are often found inside of Humidifiers. They also are found present on skin and nail infections and can cause other detrimental health problems. The Spores are normally crescent, canoe or sickle shaped, but they can be slightly pear shaped also. This species is not as common as *Penicillium*.

6. ***Alternaria*** - Molds in this Genus are very common in our daily lives. Often, this type of Mold growth is found in household dust and rye grain. Species in this Genus can produce tenuazonic and other Toxic metabolites. The Spores are either single or dual celled organisms that quickly reproduce in colors from gray to a blackish hyphae/mycelium. The size of Spores are some of the largest in the Mold world. They measure approximately 5 to 20 microns in diameter, 20 to 80+ microns in length and thus settle to the ground via gravity relatively quickly. The 'falling rate', in a weight/gravity calculation, of a 10 micron (diameter)

sized Spore is approximately 1 foot in 10 seconds, in still air. *Alternaria* can also be found on window frames indoors and in red mulch used in landscaping around houses, in carpets, textiles on horizontal surfaces of building materials, seeds, unsalted butter, rotting fruits, straw and leaves. A microscopic look at its hyphae and spore growth resemble the congruent areas (areas where groups of muscle strands meet other bands of muscle tissue) of muscle tissue on body builders. Species in this Genus may be also be related to "Bakers Asthma", which has occurred in people who work in bakeries.

7. Cryptococcus - Species in this Genera are saprophytes and are commonly called "The Carcinogenic Yeast". They feed on cereal grains and on chicken or pigeon feces. Farms that raise chickens and pigeon raisers should be aware of this Mold. The Spores vary in size from 4 to 20 microns in diameter and are oval shaped. They do not form a hyphae or mycelium. These non-fermenting Ascomycetes (a microscopic sack forming spore carrier) classified yeast growth causes 'yeast meningitis' or cryptococcosis in humans and animals. If airborne Spores are inhaled, the yeast can attack the central nervous system and eventually the spinal fluid, in rare cases. Less severe symptoms such as headache and a stiff neck are possible as well as various stages of blindness and respiratory problems, which can also occur.

8. Candida - A Yeast Fungus that commonly infests women in their vaginal area. Any one can contract a yeast infection internally from the throat to the intestines. A typical internal infestation of this yeast is a person who takes Steroids. Steroids can be

beneficially used prior to major spinal surgery but they also reduce the efficiency of the immune system and allow Candida to proliferate in our bodies. The negative health effects include a long painful burning sensation of anything that is swallowed. The first symptom is a whitish, chalk-like granular substance that forms and lines the inside of your mouth, between the gums and the inside of the lip. Some of the white yeast can be rubbed off by light scraping, but it will come right back within hours. This type of yeast infection prohibits the patient from wanting to eat anything. Swallowing your own saliva can be a difficult task. Bowel movements are hindered due to lack of food and water intake. This is not a pleasant fungal invasion of the body. The author of this book experienced the effects of this yeast infection after surgery and survived it after three weeks of insomnia and suffering with the extreme pain with each swallow.

9. **Dactylium** – Species in this Genus are commonly named 'Soft Mildew'. This is actually a Mold fungus that attacks the fruiting body of mycelium (or the root structure) which is the mushroom. This parasite at first appears as colonies of whitish cobwebbed filaments. The Mold gets its name from the type of infestation, which looks visually patchy or blotchy on its host, as Mildew is sometimes described. These types of fungi grow rapidly. A few of this Mold's enemies are salt, high alkaline substances and baking soda. The hypha/spore growth looks like a tree with branches coming off the trunk opposite of each other. The Spores are located on the tips of the smaller offshoot branches. The Mold colors can vary from white to pink. The spores can be killed at around 125 deg. F., if

sustained for about a 30 minute time frame. Infestations of this Mold commonly attack the following types of mushrooms; Agaricus (which is the common white store bought button mushrooms), Amanita, Russula and Lactarius.

10. **Epicoccum** - A slow growing, multi-colored Mold whose host determines the color of the Mold. In a grain culture, the colony is bright yellow to pink orange. On most agar media, species of Epicoccum grow slowly and appear as white mycelium. On wood, other Species can be found as small black dots in a colony. Species in this Genus can exude a yellowish fluid. The Mold Spores are roundish, blackish and the Spore size is 3 to 15 microns in diameter. The species E. oryzae has been reported to infest rice, however its primary role as a saprophyte is to enrich the soil through decomposition of wood, stems of plants and their leaves.

11. **Zygomycete** - "Bread Mold" - Species of this Mold grow fast and well on bread, especially the crusts, (of older bread) when left inside their plastic bags. Moisture inside the bag hastens growth especially when placed in the sun or in humid areas.

12. **Memnoniella** - This Genus is similar to Stachybotrys in its growing on cellulose based "Mold Food", and its Toxic Black Mold characteristics. Some Species in this Genus can also be found on decaying leaves where Spores easily become airborne and can enter a building.

13. **Mucor** - Species of Mucor go by the common names of "Macor Rot", "Black Pin Mold" or the "Black Bread Mold". The spores of M. pusillus thrive in

temperatures in the range of 65 -130+ deg. F. and are toxic. The mycelia or hyphae growth appear like the center seed producing stalk of an onion, whose Spores are gathered in a ball-like form at the top. The Mold color is gray at first then turning blackish. This Species is the prime candidate for Mold infestation in piles of compost, due to its being a true thermophile (an organism that lives in elevated temperatures). Molds in this Genus can also grow in old straw, grains, horse dung, plant debris, textiles and in wood chips. When the straw is fed to horses or other cattle, they can become sick. When wood chips are used for landscaping, heavy infestations of *Mucor* can exist and its Spores can easily hitchhike inside your home every time you go inside. *Mucor* has been known to cause brain damage in some cases. The most common Species of *Mucor* are *M. racemosus* and *M. plumbeus*. Controlling *Mucor* Mold growth is by the use of good hygienic practices, air filtration and circulation.

The above listed Fungi are only some of the more common Molds that affect our daily lives. The total number of different Fungi will never be known. New Species will be discovered every year.

How Molds Invade / Enter Our Bodies

Molds Spores can invade/enter human and animal bodies in five ways, and they can cause detrimental health problems. Molds can grow internally in our bodies, in such places as in the nose, sinuses, brain, lungs, eyes, ears, toes, liver, intestines and on other bodily organs.

1. **Inhalation** - As we breathe, indoor or outdoors, airborne Mold Spores exist and enter our lungs with almost every breath we take. There is no practical way to eliminate this natural process. There are fewer Mold Spores in the outdoor air during the Winter but there can be more airborne Spores indoors at the same time.
2. **Skin contact** - Touching Mold infested sources with fingers or any other part of the body can cause health problems through the skin. The real problem is when an individual comes in contact with Mold and the person inadvertently touches his face and either inhales or swallows the Spores, which again could cause health problems. Practice good hygiene and keep your hands away from you face. After bathing, dry out all parts of your body thoroughly, especially crevices or creases and between your toes.
3. **Ingestion** - Many types of Molds are taken orally in our every day eating of food in meals, snacks, etc... Molds can/do grow on cheese, breads, pastries, meats, fresh spices, vegetables fruits and nuts. Molds that you can see on food is evidence that Mold growth has been

happening for some time. At first, the Spores grow microscopically, so small that they cannot be seen with the naked eye or even with a magnifying glass. They then appear on food macroscopically or visually, almost overnight.

4. **Eyes** - Mold Spores can be wiped onto our eyes by our hands and clothing or Spores can naturally float and settle in them during our daily routines, such as in house cleaning.

5. **Ears** - In the same fashion as Spores get into your eyes, they can enter our bodies through your ears. Molds can grow inside our ears if Spores land there. Again by applying good hygiene practices in our daily lives, with regular cleanings you will eliminate any Mold growth.

How Molds Invade and Enter Our Homes

Mold Spores can invade/enter our homes in many ways. Since Spores are very light, the air currents provide a super highway for them to travel aimlessly. Some Mold Spores are so light, less than 2 microns in diameter, that they may never settle down to earth. Other Spores are heavier and will eventually settle on something. When your dog walks through tall plants, Spores practically jump out and attach themselves to him. An animal's paws and hair are very good places for Spores to cling to. The dog then comes in the house, lays down on the carpet and goes to sleep. Simultaneously, Spores were being released indoors as the dog ran inside, wagged his tail and rolled on the carpet. New Spores are now everywhere inside the house. Every time the dog goes out and comes back in, more Spores hitchhike their way into our houses.

Every time a house door is opened or closed, more Spores come in, then go out. Our houses are "Spore Banks". Many of the Spores settle in the House and don't get airborne again unless they somehow are disturbed, and an air current takes it to a new location, to potentially germinate and grow into Mold, if moisture and any Mold Food is encountered.

Every time we go on vacation we bring Spores back from that area via them tagging along on our clothes, luggage and in our vehicles.

We are building up supplies of many species of Mold Spores in our houses and they are just hanging around waiting for the chance of a lifetime, or is that a

chance of a sporetime, to grow and cause us problems. Not every Spore gets a chance to germinate, but many do.

The possibilities of how Spores enter our lives is endless. Man has even taken Spores outside our earth's atmosphere into the Mir Space Lab. Humans shed many pounds of skin each year; the number has been reported to be up to 30 lbs/year for an average size adult. It also happens in space. Spores hitchhiked for a million mile ride, and invaded the Laboratory. The place started to wreak from Mold growing on the shed skin from the astronauts. Spores, Spores, they are everywhere, and can be found anywhere!

Health Related Symptoms Due to Molds

To understand the relationship between Mold and your health, you must first understand your immune system and allergies. In the United States there are more than 50 million people (approx. 1 out of every 5) or about 20% of the population that suffer from asthma and/or allergies. Per the Asthma & Allergy Foundation of America (AAFA) allergies are the 6th leading cause of Chronic disease in the US, and allergies cost the health care system \$18 billion annually. The AAFA states that hay fever has increased substantially over the past 15 years and about 16.7 million visits to health care providers are due to allergic rhinitis. There are now over 200 indoor pollutants in the average house, and some are traced to the increases in allergies. In the last few years, indoor pollutants have been found to be 2 - 5 times higher and sometimes 100 times higher than outdoors. The EPA places indoor pollution as one of the top environmental health risks. It also reports on outside air quality, using a scale of 0 - 500 with an air quality greater than 100, being unhealthy.

An allergy is a hypersensitive reaction to a substance that is ordinarily harmless to most people, but perceived as possibly dangerous by your body. The substances are called allergens. Although usually harmless to many people, certain foods, perfumes and soaps, etc., can affect a person who has allergies. These substances (which are called "triggers") cause the body to defend itself against them, by producing antibodies. You may have a family history of allergies or you may

react to environmental triggers. If an individual comes from a family in which both parents have allergies, then they have a 50% chance of having allergies. If only one parent has allergies then an individual has a 30% chance of having allergies. Hay fever and asthma are the most commonly inherited allergies.

You can react to many triggers indoors or outdoors. Some indoor triggers can be animal dander, feathers, dust mites, cockroach droppings, cleaning chemicals, aerosol sprays, perfume, latex rubber, metals, tobacco smoke, peanuts, other foods (like milk, wheat, eggs, shellfish, chocolate & food additives), medications (like penicillin), and Mold. Some outdoor triggers are pollen, trees, grasses, insect bites, weeds, insecticides, paint fumes, exhaust, pollution, smoke from burning wood, cold air, exercise, and Mold. These triggers can be on- going, or just seasonal. With Mold Spores being everywhere in our environment it will be impossible to avoid them, and it is one of the causes of perennial allergic rhinitis along with dust mites and animal dander. You may develop an allergy at any time in your life. Allergic reactions can range from a mild reaction to a very severe anaphylactic reaction causing death. It can happen immediately or over a period of years.

When a person with allergic tendencies encounters an allergen, his body reacts to the allergen like your body would react if it were fighting a bacteria or virus. When you think of your body in an allergic reaction, think of it as your body going to war, to fight off invaders. The job of the immune system is to protect the body from foreign invaders that can harm it, by destroying them or neutralizing them. In today's world, our bodies are having a tough time keeping us healthy, and it makes it harder if you are going

through physical or emotional stress. Our day to day lives, including what we put into our bodies, keep the antibodies working 24 /7. If you are sensitive to the allergen, your body thinks of the allergen as a foreign enemy that can attack the body. They may attack your body by land (touch), sea (swallowed), or air (inhaled). Your immune system is very observant in its action of search, identify, and destroy. When the immune system identifies a harmful invader or allergen, it mobilizes its armed forces to attack (produces antibodies). An antibody is a disease-fighting protein called immunoglobulin E or IgE. Your body has a specific IgE for each allergen. One will be produced to react against Mold. Another IgE will be produced to react against ragweed, etc. We would send the Army to protect us against enemy ground troops, the Navy to fight against a water assault and the Air Force to protect against an air attack. The first time an allergy prone person is exposed to an allergen, he makes large amounts of, for example the Mold IgE antibody. These IgE molecules stick to the surfaces of the mast cells (cells that line the respiratory and gastrointestinal tract and skin) or basophiles (a circulating white blood cell). Mast cells are plentiful in the lungs, skin, tongue and linings of the nose and gastrointestinal tract. These molecules circulate in the blood or reside in certain cells where they specifically counteract the invader. The next encounter with the allergen, usually leads to an even greater reaction due to the antibodies that signal the mast cells and basophiles to flood the area with Histamine and other chemicals. Histamine is a body chemical that can act as an irritating stimulant. As a Histamine prepares for an attack, it inflames the surrounding tissues (nasal passages, sinuses & eyelids), and you experience symptoms like sneezing, itchy

eyes, and runny nose (typical allergy like symptoms). If you are not allergic to these triggers the mucous in your nasal passages just moves alien particles into your throat where they can be swallowed or coughed and spit out. Children are more susceptible to these airborne pollutants since their lungs are still developing and they breathe much faster, than adults do, per minute.

There are many symptoms you can have when you have an allergy attack. Some of them are: a runny nose, repetitive sneezing, coughing, nasal congestion and inflammation, red itchy eyes, ears, nose and throat, ear plugging, conjunctivitis, watery eyes, nasal stuffiness, post nasal drip, sinus headaches, chronic sinusitis, frequent ear infections, hives, rashes, itchy skin, swelling of lips, tongue or face, swelling at the site of an insect bite, tightening of the throat, nausea, vomiting, wheezing, diarrhea, fatigue, "allergic eyes" or "allergic shiners" (dark areas under eyes from increased blood flow and pooling), breathing difficulties and anaphylaxis in some cases.

Anaphylaxis is a severe allergic reaction in a person previously sensitized to an allergen that may be local or systemic. Local reactions can cause signs to appear at the site of interaction. Symptoms can be: skin warm to touch, hives, swelling, and reddening of the skin. In systemic anaphylaxis it can involve the respiratory, cardiovascular and gastrointestinal system, along with the skin. Symptoms can be: hives, swelling of the skin, mucous membranes or internal organs, flushing, wheezing, difficulty breathing, increased mucous production, nausea, vomiting, abdominal cramps, increased pulse rate, sudden drop in blood pressure, and feelings of generalized anxiety. Systemic anaphylaxis may be mild or severe enough to cause

shock when massive life threatening vasodilatation is present. Without proper treatment death can occur.

Having allergies makes you more prone to sinusitis (inflammation of the sinuses), sinus infections and asthma. Sinusitis can last just a few weeks or become a chronic on-going problem. It affects over 37 million Americans per year. People prone to sinus infections miss approximately 4 days of work per year due to their sinus problems. Sinus infections can be caused by bacteria, fungi and viruses. People with weakened immune systems such as AIDS, asthma sufferers and people with Cystic Fibrosis are also more susceptible. One of the most common symptoms is severe "sinus headache". The MAYO Clinic in Minnesota has identified Mold as the leading cause of most chronic sinus infections. Antibiotics are typically used to treat sinusitis, but antibiotics may not be effective because they target bacteria not fungi. Allergic Fungal Sinusitis (as defined by Tabors) is a chronic nasal obstruction with symptoms that include runny nose and postnasal discharge; it is caused by allergies to soil-based fungi (such as *Curvularia* or *Alternaria*). Fungal sinusitis can also involve the eyes and the brain.

Allergies can lead to asthma, especially in children. Asthma is due to hypersensitivity to an allergen/trigger that causes the tracheobronchial tree to react and cause narrowing, inflammation and excess mucus production in the airways. This narrowing and swelling makes it hard to breathe. Asthma can also be caused by exercise and is called exercise-induced asthma. Most people have symptoms such as shortness of breath, tightness, coughing and wheezing. An asthma attack can develop quickly, be mild or life-threatening. The EPA states "In the United States 15

million people have asthma and it affects nearly 1 in 13 school age children. Asthma is the leading cause of school absenteeism with 10 million days missed each year." Now that you understand how your body reacts to an allergen we can get more specific on Mold. There are 5 Kingdoms of life. They are; Animal, Plant, Protozoa, Bacteria and Fungi. Mold belongs to the Fungi Kingdom along with Yeasts and Mushrooms. Not all fungi are bad. There is a Mold that the antibiotic Penicillin is made from, yeasts that help us in baking & beer making and many edible mushrooms that are considered delicacies. Fungi lack chlorophyll, so they must absorb food from others. They do not ingest their food, but absorb nutrients by attacking dead organic matter or parasitizing living organisms. Mold needs Oxygen, an organic food source ("Mold Food") and a moist environment to grow. Molds are very useful in nature for breaking down dead matter and turning it into soil. They are very good recyclers and are considered nature's garbage disposal. Molds are sensitive to sunlight. Spores are the reproductive part of the fungus, like seeds of a plant. Mold Spores are microscopic and too small to be seen by the naked eye. They are smaller than, and usually out-number pollen grain concentrations in the air. A single mold growth can propagate millions of spores, much like plants release pollen. Mold Spores are very buoyant and are circulated by air currents in our environment. As the Mold Spores land and commence growing on some fertile "Mold Food", the Spores take root and you will start to see the "fuzzy" filament-like bodies called hyphae. A group of hyphae are called mycelium and can be seen, usually as white streaks, when decomposing matter is disturbed. Mold/Mold Spores are practically everywhere. When dealing with

allergies, most doctors' advise you to avoid exposure to the allergen; that is one thing we cannot do with Mold. You'll find Mold outdoors and indoors, it grows all year round. Outdoor Mold Spores can find their way into your house via the wind, or hitchhike on/in your clothes, shoes, insects and pets. They cannot be eliminated in your normal environment unless we live in a "clean room". Two of the places on earth that you may not be able to find Mold growing are in a salt mine or a borate mine but the Spores are there. In a recent newspaper article, David Rosenfeld from Hebrew University in Jerusalem, states "The world's oceans could be helping to clean the atmosphere, the salty sea spray encourages rain that washes out dust and other pollutants. Practically all the pollutants are removed at the lower layer of the atmosphere. It's the salt that does the trick". Unlike pollen and weed particulates, Mold Spores don't die after the first hard frost. Some Molds can grow in sub freezing temperatures and others have been found lying dormant in Amber volcanic rock. People allergic to Mold may have symptoms all year round, especially in the warmer, humid climates. Spore counts may vary between night and day. You will find that dry Spore types circulate more frequently during the day and wet Spore types mostly at night. After a significant snowfall, lower outdoor Mold Spore count has been found, but that does not kill Mold Spores. Even though rain can wash some larger Spores out of the air, it can result in smaller Spores being propelled into the air. That is why some allergy related Mold problems seem to increase during rainy days. Mold Spores are higher in the early spring, late summer and early fall, but can be found year round indoors. After the spring melt, Mold flourishes on the vegetation that has been

killed by the winter cold. Mold loves compost pits, rotting logs, and fallen leaves, especially if it is in a moist, shady area. Some Molds grow on grains like wheat, oats, barley, corn, and in grain storage areas, which are havens for Mold. Mold growing indoors is there all year round, even in the colder areas.

Per the EPA although “there is no practical way to eliminate all Mold and Mold Spores in the indoor environment, one way to control indoor Mold growth is to control moisture”. Indoor Mold can certainly be found in damp areas, like basements, bathrooms, areas of high humidity, and places where you can find signs of water damage. You can find Mold growing in every house, but the amount and intensity of the infestations will vary. Newly built houses are another problem. They are being built with tighter construction methods which can reduce outside to inside air interchange, reduce circulation of the inside air and cause higher moisture levels inside. Older buildings, without the storm windows, extra insulation etc. were more open to the outside air and have more natural ventilation. Once Mold starts growing and releases its microscopic Mold Spores, they will become airborne and circulate all through your house in the ventilation systems, until they land on a nice moist environment to begin growing and the cycle starts all over again. The EPA has also found that “dead Mold may still cause allergic reactions in some people, so it is not enough to simply kill the Mold, it must also be removed”. The Minnesota Department of Health states, “Indoor Mold growth has been associated with the “Sick Building Syndrome” and with instances of building related illnesses”.

Although Mold is only one of many possible causes of symptoms related to poor Indoor Air Quality,

it should be considered a potential hazard to occupants whenever evidence suggests excess moisture is occurring. Because it isn't possible to know what amount of Mold or Mold Spores is safe to an individual, it is wise to cautiously assume any visible Mold indoors may cause problems and therefore, should be removed."

Your home is not the only place you could come in contact with Mold. Your work place and/or your child's schools are other places to think about exposure to Mold especially if you are having symptoms away from your home environment. If your school or work place has a group of people that have some of the symptoms described here you may have the "Sick Building Syndrome. Some workers at work places such as farms, greenhouses, breweries, bakeries, certain mills, forestry workers, and people with jobs that involve working with wood products and fabrics, frequently work in moldy surroundings. If you do suspect you or your family are having symptoms from exposure to Mold, you should consult your physician immediately.

Mold can be found in your food and in the refrigerator. It can be found in your house plants, air conditioners, humidifiers, mattresses, foam pillows, garbage pans, carpets, washers, dryer vents, plungers, and upholstered furniture. If you are sensitive to Molds be aware that certain cheeses are processed with fungi. Sometimes, mushrooms, dried fruits and foods containing yeast or soy sauce have been known to produce allergic symptoms. In the summer of 2002, a new meat substitute made from a fungus, called Quorn has been making news. The Center for Science in the Public Interest, a DC health organization, wants Quorn removed from the market, because of illnesses from

consuming the product in 10% of the people who eat it. It has only been on the market in the US since January 2002. However, it has been marketed overseas since 1985. The description on the label as being made from mushrooms is misleading. A health organization states that it is made from Mold. Some of the symptoms from ingestion are: nausea, diarrhea, hives, shortness of breath and fainting spells. It sells as chicken patties, chicken nuggets, chicken cutlets, lasagna, fettuccine alfredo and imitation ground beef. Read your labels!

If you are a Mold sensitive individual try to keep your lodgings as Mold free as possible and avoid high Mold areas. If you have materials infected with Mold, clean/disinfect them and then remove them from your environment.

At present there are NO regulations or standards for airborne concentrations of Molds or Mold Spores. There are no EPA, CDC, or Federal limits, standards or guidelines as of the Winter of 2002. This is primarily due to the many ways to do sampling, different variations in levels of organisms, lack of agreement between agencies on what constitutes a problem, and because it is such a recently uncovered health problem. According to the American Lung Association and the EPA "Most Americans spend 90% of their time indoors, often at home. Therefore, breathing clean indoor air can have an important impact on health. People who are inside a great deal of time, may be at greater risk of developing health problems or having problems made worse by indoor air pollutants." "Mold exposure can irritate the eyes, skin, nose, throat and lungs of both mold-allergic and non-allergic people", per the EPA. Other symptoms can include chronic colds and/or flu like symptoms,

headaches, skin rashes, coughing, bloody noses, nausea, achy feeling, and balance disorders.

Allergic individuals, young children, elderly, immune compromised (HIV positive individuals, cancer patients in chemotherapy and people on corticosteroids), and pregnant women will be the most sensitive to Mold problems. There are some people that just react more quickly to contaminants than others. Molds can cause an asthma attack in sensitive individuals.

The most Common indoor molds according to the CDC are *Aspergillus*, *Cladosporium*, *Penicillium* and *Alternaria*. Some other common molds are *Helminthosporium*, *Epicoccum*, *Fusarium*, *Mucor*, *Rhizopus*, and *Aureobasidium* (*Pullularia*).

Mold has been around since the beginning of time. One of the earliest accounts of biological and chemical weapons was in the 7th century BC where it is said the Assyrians used Ergot, to poison water supplies. Ergotism is caused by ingestion of rye products infected with fungi containing Ergot. Symptoms include gangrene, convulsions, and death. Have you ever heard the term "Saint Anthony's Fire"? This is a plant disease caused by the fungus *Claviceps purpurea*. It is more common in rye but can infect other grains also. When wheat fields were abandoned in the Middle Ages, Rye (a weed grain) would take over the fields. Although it wasn't until around the 5th century that rye was used as a food product. The "Fire" portion of the name came about because of the burning sensations in the arms and legs, and "Saint Anthony's" because the hospitals that were set up to take care of these patients were dedicated to St. Anthony. Around the year 900 AD when written records were kept, severe epidemics were recorded

attributed to Ergotism, every 5 to 10 years. These epidemics were common in France at that time because rye was a crop of the poor and the cool wet climate was a good growing medium for Ergot. The rye and the Ergot were ground together during the milling process and the flour became contaminated, in 944 AD, 40,000 people died in southern France from Ergotism. There have been many documented cases of ergotism over time. In 1927, in Russia, 10,000 cases were reported. There are some medicines that are extracted from Ergot. Ergotamine is used for migraine headaches and Ergonovine is used to control postpartum bleeding after having a baby. This Species was also the original source from which LSD was first isolated and first used for psychiatric disorders.

There are some fungi that infect hair, skin, and nails. The transmission usually occurs by direct contact with soil or indirectly by sharing clothes, towels or grooming items.

Stachybotrys chartarum (also known as *Stachybotrys atra* and *Stachybotrys alternans*) is a greenish black Mold. As this Mold grows in your home, the Mold Spores are continuously released by the mold colonies, and can travel through your home's ventilation system. In rare cases, if your home is infested with this toxic Mold, the most affordable and the best remedy to the situation, is to knock it down and start over. *Stachybotrys* grows well on wood, plaster, ceiling tiles, wallpaper, insulation, tobacco products, sheet rock, or any high cellulose product, and is found on plant debris and in the soil. It has even been found to grow on paper, dust and lint. Most of the time *Stachybotrys* is found in a water damaged medium that is, on going, has gone unnoticed or been ignored. Many times it is found growing behind walls,

not easily seen from a routine inspection and it endlessly produces toxins, undetected. The accepted way to identify *Stachybotrys* is by Air Sampling and the Tape Lift method, since *Stachybotrys* does not always grow well on a culture plate medium. There are certain molds, primarily *Chaetomium* and *Arthrinium*, and secondly, *Pithomyces*, *Stemphylium*, *Torula* and *Ulocladium*, that can grow in the same growing environment that *Stachybotrys* can propagate in. If they are detected in good quantities, then your home is conducive to growing *Stachybotrys* Mold too! It has been documented that cattle have died from hemorrhages after eating feed contaminated with *Stachybotrys chartarum*.

The "Black Molds", *Memnoniella*, and *Stachybotrys*, are known to produce mycotoxins. Mycotoxins, as defined by the EPA, "are fungal metabolites that have toxic effects ranging from short term irritation to immunosuppression and cancer". There are over 200 Mycotoxins known now but the study is relatively young and many more are bound to be found. Mycotoxins are produced by the Mold during digestion, and are present in Spores. The mycotoxins give the molds an advantage over other organisms they may be competing against in their food chain. When the Mold source is disturbed, whether by human involvement, air currents or pets, mycotoxic Spores get airborne, and are inhaled. Mycotoxins are found in both living and dead Mold Spores, and can cause allergic and other toxic effects.

Stachybotrys has been the fungus that has been making news in the past several years, as one of the most serious threats to human health. In 1994, the Center for Disease Control (CDC) agreed with the research available to them at that time, that infants in

Cleveland, Ohio who inhaled *Stachybotrys* or “Toxic Black Mold” Spores, lived in water damaged, highly contaminated buildings, with very high air and surface sampling levels of *Stachybotrys chartarum*. It caused bleeding in their lungs or a condition known as pulmonary hemosiderosis. It is an uncommon condition found mostly in young children, but can occur in adults. Since that time, Black Mold has become one of the fastest growing health hazards in the United States. However, early in 2001, the CDC reversed its position, based upon the lack of scientific evidence. The CDC has not confirmed nor denied that a specific problem with exposure to *Stachybotrys chartarum* or other molds exists but does advise further research. The EPA and the Cleveland Department of Health still believe that *Stachybotrys* was responsible for the hemosiderosis in the infants. It had been documented, to date that, 9 of the 36 infants from these homes have died.

Other medical research has/is proving that inhaling or eating toxic Mold Spores can cause infections, allergic reactions, cancer and even death. A home infected with this Mold produces a potential deadly atmosphere for anyone. In May 1997 the Journal of the American Medical Association carried a news story called “Floods carry potential for Toxic Mold disease” (Marwick, 1997). The mycotoxin, Satratoxin is produced by *Stachybotrys* and is poisonous when inhaled. It is stated that *Stachybotrys* is a slow growing Mold and doesn’t compete well with other rapidly growing Molds. It is rarely found outdoors. That could be because it is usually hidden and the Spores are in a gelatinous mass and spread more when it dries.

Some symptoms from exposure to *Stachybotrys* are chronic fatigue, fever, chronic headaches, irritation to eyes, inflammation and/or burning of the mucous membranes in your mouth, nose and throat, sneezing, skin rashes, tightness in the chest, difficulty breathing, dizziness, chronic cough, coughing up blood, cold and flu like symptoms, hair loss, forgetfulness, memory loss, nausea, vomiting & diarrhea, bleeding in lungs, nose bleeds, asthma, and death. Sometimes, the only way to eradicate a structure of "Toxic Mold" is to remove parts of the house and haul off the debris to the dump. In big jobs, make sure you have a qualified Professional execute the Remediation and remove it the right way, or you will probably make the problem worse and broadcast the Spores all over, to start growing again.

Cladosporium, is a common Mold found in both indoor and outdoor air samples. Outdoors it may be the most common and numerous Molds found. Indoors, it is usually found on surface of fiberglass duct liners (in the interior or supply ducts), air vents, dead plants, woody plants, food, straw, soil, paint and textiles. It is light green to black in color. Sensitive individuals exposed to high levels of this Mold are more likely to develop an allergy or asthma symptoms. *Cladosporium werneckii* or *Cladosporium mansonii* are the causes of the condition tinea nigra. Tinea is any fungal disease, found all over the world, occurring on the body, commonly called ringworm. This fungus will live on dead tissues of your hair, nails and skin. The chances of having this fungus grow on your body are increased by poor hygiene, continually moist skin and minor injuries. Tinea nigra is a fungus infection that affects the palms of the hands. Tinea corporis is ringworm of the body. Tinea capitis is ringworm of

the scalp. Tinea pedis is a fungus infection of the foot. We commonly call it Athlete's foot and it is caused by fungi that thrive in warm moist areas. The usual symptoms of Athlete's foot is itching, stinging, burning and cracking & peeling of skin on your foot and between your toes. Athlete's foot is mildly contagious, but easily spread by contact in public showers and swimming areas, or by sharing towels or stepping on contaminated bath mats. You catch ringworm from direct contact with other people, animals (your pets), or from the soil. It is usually remedied by using an anti-fungal agent, but you should contact your physician: he may need to prescribe an oral anti fungal medication. Cladosporiosis is an infection, usually of the central nervous system caused by the fungus Cladosporium.

Aspergillus Mold, (blue and green mold) is another common Mold in our environment, and found world wide. It can be almost any color. Some of the Aspergillus' approximately 200 Species produce toxins called Aflatoxins, Citrinin, Gliotoxin, Patulin, Sterigmatocystin and Ochratoxin. Aflatoxins are one of the more potent carcinogens in our environment. Both Aflatoxin and Ochratoxin, are Mold toxins that have been classified by the National Toxicology Program as human carcinogens. The maximum allowable levels of total aflatoxin in food commodities is at 20 part per billion, set by the FDA. The maximum level for milk products is even lower, at 0.5 parts per billion. This toxin is poisonous to humans if ingested and toxic to the liver. Ochratoxin is damaging to the kidneys, liver, and impairs the immune system. Citrinin is a nephrotoxin, linked with renal damage, vasodilatation and bronchial constriction. Gliotoxin is an immunosuppressive toxin. Patulin causes

hemorrhaging in the brain and lungs and is linked to grape and apple spoilage. Sterigmatocystin is a nephrotoxin and hepatotoxin and is considered carcinogenic. It may find its way into your respiratory system and actively grow in the lungs forming a "fungus ball", a compact sphere. There is also a condition called allergic bronchopulmonary aspergillosis, which causes the person to wheeze, have a low-grade fever and cough up brown sputum and mucus plugs. It can invade just your lungs and/or your brain, kidneys and heart valves. Aspergillus spores are frequently found in hospitals, and is a big concern in bone marrow patients. It has been found to cause corneal (eye), otomycotic (ear) and nasoorbital (nose) infections. In collecting samples of Aspergillus, whether cultures, tape lifts or air samples are taken, the spores are almost indistinguishable from Penicillium, on cultured samples, unless conidiophores are present.

Fusarium is a common fungus that produces trichothecene toxins, which target the circulatory, alimentary, skin and nervous systems. Also, it is found in some skin, eye and nail infections. If an infected grain is ingested, symptoms may include nausea, vomiting, diarrhea, dermatitis, and extensive internal bleeding.

Candida infections are fungal infections caused by yeast. They can cause infections of the skin, nails, vagina, mouth and throat (Thrush). It can also invade the bloodstream in immunosuppressed, and burn dialysis patients. Candida are present in your body's normal flora, but, when there is a disruption in your body, it makes you more susceptible. Candida can multiply and take over in conditions of pregnancy, obesity, diabetes, cancers, immune suppressed individuals, people taking antibiotics or high doses of

corticosteroids. Candidis of the nails can occur in individuals who have their hands in water a lot or wear plastic-like gloves. People who are overweight or incontinent of urine, are at risk because it can grow in the skin folds that are constantly wet. Personal hygiene again plays a part in Mold infestations.

Sources of Indoor Moisture

Listed below are some potential sources of moisture and/or areas in the home that can permit the start of Mold and eventually lead to Mold infestations, if not remedied within 24 to 48 hours after an event:

1. Floods - Any room, especially cellars or basements damaged by flooding are great candidates for Mold growth. Mold Spores that are found naturally in the ground are transported by rising and settling waters during floods. Houses in "Flood Zones" are particularly vulnerable to Mold invasion.
2. Pipes - Water from leaky pipes can drip or run onto many different types of "Mold Food" and incubate what could be the beginning of a very expensive repair bill or be as cheap as fixing the leak yourself. Inspect for Mold growth and get the area cleaned up and dried quickly. The quicker the fix the cheaper the cost. Simple condensation on pipes can drip on "Mold Food" and start a problem if not corrected.
3. Roofs - Roof leaks are particularly hard to find and usually very expensive to fix. Depending upon the age of the roof and the number of layers on the roof will determine the amount of damage. Roof leaks usually do not appear where the leak is. Water has a gravity way of finding nooks and crannies to go into that are not obvious to the naked eye. The area that reveals the leak can be many feet away from the source of the leak. Since roofs are hard to access

from the inside, depending upon the construction type, finding the leak can be difficult. If you're lucky, and the root cause of your leaky roof was shingles recently torn off by high winds, you may have a cheap fix unless the roof is left damaged for a long period of time.

4. Faucets - Bathrooms, kitchens, outdoor faucets, laundry rooms, sauna rooms, etc... all have the potential for water leaks and repeated spills. These areas should become obvious areas to inspect for Mold and should be kept dry. A Mold infested two family home in Central NY was discovered in the Spring of 2002 and caused the tenants to develop flu-like symptoms. The local Department of Health could not force the landlord to clean up the problem immediately, due to lack of Mold Enforcement Codes on the books. The tenants moved out as soon as they found a new place to live. After Remediation, the Landlord may not be able to rent out that apartment because the small size community has "labeled" the building as being "Mold Infested" or having the "Sick Building Syndrome". The bad word has spread throughout the area and the building may have to be bulldozed.
5. Toilets - Another case of Toxic Black Mold infestation also occurred in a residential home in Central, NY. It was caused by a leaky toilet seal which allowed water to leak throughout the floor and walls in quite a large area of the house. It all started sometime in 2001 and it sparked a highly publicized series of reports in the local news media in the spring of 2002. The family endured allergic reactions and asthma related symptoms for many

months. When they finally got help and figured out the problem, they moved out. After a couple of weeks they started feeling better. At the time of this writing, the family is still living in a hotel while they are getting some of the repairs done, simultaneously trying to get somebody to pay the total repair costs which will run approx. \$100,000 to fix a \$250,000 house (worth that prior to the Mold problem). This family has been totally uprooted by Mold! Their good health, property and belongings have all been ruined.

6. Refrigerators - Condensation inside of refrigerators can be found on food and start Mold growth on vegetables or spilled water can find its way onto floors. Water and ice makers have a waterline connection in the back. Moving refrigerators around for cleaning can put stresses on the fittings and cause drips that may go unnoticed for long periods of time. The water can drip on the floor and the elements for Mold growth become present, especially when there is usually a lot of dust under the appliance. When refrigerators, with waterlines connected, are moved, be aware and check the floor for any leaks for a couple of days after the unit has been replaced back to its original position. Also, ensure that the waterline has enough "play" in it, and has been properly fastened at the connections. Somewhere on the back side of the refrigerator the waterline should be fastened to relieve strain on the pipe connection. Follow the directions that come with the refrigerator for proper installation or have a professional do it. Mold will also grow on the

sealing gaskets that are located on the door(s).
Inspect for and clean these gaskets periodically.

7. Dishwashers - This appliance is notorious for water leaks and steam releasing thru a vent in the front. There are two water connections to this unit - a hot water inlet and a hose connected to a drain pipe. Another area for water leaking is through the seals between the door and the front of the unit. These units are not normally moved after their initial installation. Hopefully good quality parts and a qualified installer were used. If not, water slowly dripping in an inaccessible area can go on unnoticed for years if installed improperly. This condition can really ruin a person's day when the damage is found, usually when it has to be replaced, but then it's too late!

8. Water Heaters - How often do you look around your water heater, especially when it is usually located in some corner of a basement, closet or laundry room? Water can contain many different chemicals, minerals and believe it or not, corrosive elements, which can shorten the life and efficiency of a unit and start a leak, typically at the bottom of the tank. Usually the life of an efficient water heater is under 10 years. It is better to be on a preventative maintenance schedule with water heaters to try and ward off future problems, than to wait for them to leak, unnoticed. Look at the connections and the bottom of the tank periodically. Without spilling water all over the place, drain a few gallons of water from the drainage valve, located on the bottom side of the unit, on a monthly or bi-monthly basis. You may be surprised to find

the volume of calcium, minerals and other elements that come out with the water that has settled on the bottom of the tank. Areas that have “hard water” are especially prone to heavy settlements of particulates in their tanks. Ensure that the drainage valve does not leak after closing it. There are three water connections that can also produce leaks if not properly installed: a cold water inlet, a hot water outlet, and the drain at the bottom. Again, proper installation can be preventive medicine for Mold growth. Due to the heater’s location, leaks can go on unnoticed for weeks, and possibly months. Depending upon its location, what is near or around it and how the area drains, could be a recipe for a costly cleanup and fix.

9. Sewers - All homes and habitable dwellings have sewer pipes that allow for the disposal of everything we put down our sinks, bathtubs, toilets and any other appliances that requires drainage. Sewers in city homes drain directly into a municipality’s pipes and down to the sewage treatment plant. Rural homes drain their sewage into a variety of either holding tanks buried underground and/or leaching systems. Any sewer can back up under a number of conditions such as flooding and blockage. When this happens, there is usually a foul odor and potentially toxic fumes present. Besides being a health risk, this would be a warning sign of moisture in the home and inevitable Mold growth will occur in the very near future if the area isn’t cleaned, dried, sanitized and disinfected immediately.

10. Basements, Cellars and Crawl Spaces - These places are a haven for Mold growth. Water from a number of sources can become the basis for infestations. Proper drainage along the outside of the foundation can help prevent water seepage into a basement. Older homes that have cracks in their concrete walls and floors are a sure way for water entry. Homes built with stone foundations should be "faced" with concrete or a suitable material to prevent water entry. Heating and Cooling Air Conditioning Units should not be located under a crawl space for there isn't much fresh air under there. Carpets should not be used on concrete floors. Not only will moisture form under carpets naturally, but when there is other water infiltration due to flooding, spills or whatever, it can take a long period of time to dry out. In that time, Mold can start to grow. Once the area is dry, the Mold Spores are still there and if disturbed will become airborne and land somewhere. If that somewhere contains moisture and has Mold Food available then the whole life cycle of Mold Spores can be repeated time after time. Cellars are typical places to store things accumulated through the years. If the objects are stacked up against walls, covering the concrete floor, and water enters the area, many of the things stored in boxes and in other Mold Food containers can become perfect items for fungal growth. How many items do you have in your basement that fall into this situation?

11. Fruit/Root Cellars - These are great places to store foods for long periods of time. Moisture must be controlled and air ventilation is required especially if onions, garlic, potatoes, fruit and other

foods are stored for extended periods of time. Many different kinds of Mold can infest your harvest. Someone once said " One bad apple in the basket will spoil the whole bunch". Could this proverbial phrase been thought of long ago, when some farmer realized the relationship between Mold and crop storage? Probably, for man has often found problems and he has stumbled on solutions for them. We get around the problem in one way or another - its called "Yankee Ingenuity"!

The sources of indoor moisture are numerous and not limited to those cited above. Awareness and common sense are again two of the best weapons in preventing indoor moisture or being able to fix a situation as it arises.

Items / Materials that can become “Mold Food”

Mold can grow on almost anything when moisture is present, especially if there is high nutritional value in the host or substrate. Even though Mold Spores are everywhere, Mold will not grow in borate, or in salt mines, on clean rocks, brick chips, metals, glass or any concrete products. If Mold is found on concrete blocks used for foundations of houses, or any other non Mold Food, the Mold is most likely growing on dirt, dust or on the paint, if the item was painted.

Don't be fooled however! A buildup of oil or kerosene soot on walls and ceilings along with frequent use of candles in the same area, can give the darkish appearance of Mold growth.

Many of the so called “Black Molds” are not really black in color, though some are. Generally, the appearance of the black color is due in most part to the large amount of the Mold growth in a small area, or in a colony. Toxic black molds can take on many colors, but they usually are darker in color or a shade of brown. The brown color appears blackish when in heavy concentrations. Mold can grow and multiply at an alarming rate if the conditions are right, per an individual Species of Mold.

Water and air are not to be considered as “Mold Foods”. They are just two of the other requirements needed for Mold propagation. Following is a list of some of the more common items found in our everyday lives that can, and do become, “Mold Food”.

Two Species of *Stachybotrys*, *atra* and *chartarum* or “Black Mold”, as it has been generally labeled, require either cellulose or cotton-based products to grow on/in. These two base materials are used in the manufacture of an almost endless number of products. Some of the most common examples of cellulose based Mold Foods are: drywall, gypsum board, sheet rock, ceiling tiles, furniture, newspapers, paper bags, cardboard boxes, wall paneling, floors, carpeting, drapes, insulation, dynamite, and any kind of wood. Do not store any firewood inside your house. The wood can contain Mold Spores and they can be released by air currents inside the house. Do not use wood chips as mulch around the house. Woodchips do enhance the look of a property, but they are loaded with Mold. Since Spores are hitchhikers, every time you pass by the chips, the Spores can be attracted to your clothes, via static electricity, and they will be carried into your house. Also, when a door is opened, the Spores rush in by the air currents created. The end result is that humans and animals carry more Spores indoors, then are carried back outdoors. Our houses keep storing up more and more Spores everyday. Houses have become warehouses or storage banks for Spores. Most of them settle down on something, just waiting for some moisture, to start growing. In the past 25 years, more houses have been using woodchips for landscaping than ever before. This is another reason why Mold is being found more frequently throughout homes in this country.

The following are just some of a few cotton based items that can become Mold Food: clothes, blankets, sheets, sleeping bags, pillow cases, rags, towels, carpets, rugs, drapes, furniture, hats, pot holders, shoes and the list goes on and on.

Other favorite Mold Foods are materials and films on shower stalls and bathtubs. These areas provide ripe conditions for Mold growth.

Obviously, Mold can grow on many items, but the following are some items that are not so obvious, but are in front of our faces everyday:

Food - Like we humans, Mold loves our types of food also. Just leave some edible food out in the air for a few days and watch what happens. Old food left in the back of the refrigerator for a week or so will yield a neat surprise when found. Anything from meat to potatoes can grow Mold. Eventually that older, opened bottle of spaghetti sauce will grow a greenish colored fuzzy Mold. Examine your food prior to reheating it and putting it in your mouth. How many times have you gone to make a sandwich and noticed a green Mold growing on the bread. Well we won't necessarily die from eating food with green Mold on it, because it probably isn't toxic, but no Mold is good Mold that is ingested into our bodies. Allergic reactions can take place in any person who is susceptible to Molds. Nuts, rice, grains, meats, vegetables and a host of other daily foods that we eat, must all be inspected for Mold contaminations. Purchase items that you will use in the near future. Don't buy a bag of nuts, put them in a cupboard and forget about them for months. Also, don't just take it for granted, that stores, only sell fresh or non contaminated food. Buyer beware!

Juices and Soda - Leave a little soda in a bottle with the cap on it and put it aside for a week or so. Look at it periodically and soon Mold will appear inside the bottle. How and when did the Spores get inside the bottle? Sometime when the cap was off, a Spore settled inside the bottle's opening, or was a

Spore transported from your saliva in your mouth to the soda when you took a sip? Spores are everywhere.

Bird Food - Bird food that is left in a bag near a moist area, like on concrete, or in a garage will grow Mold eventually. The birds don't like Mold either, so look at the seeds prior to filling up your feeders for any contamination. The way to prevent Mold in a bag of bird seed, is to use it up within a reasonable amount of time, a week or two, and store it in an dry place. Don't waste your time and money on putting out bird food if you are going to feed the birds contaminated seed.

Grains - Historically, dangerous Mold and Mold Spores have contaminated grain bins in processing plants and farms throughout the world. Mold infestations in grains have been documented and are scientifically proven to have been found in livestock and in humans.

Shed human skin - This is probably one of the first Mold infestations by man in space. A few years ago, many miles above the earth, the orbiting Russian Space Station, Mir, became infested with Mold. The Mold grew on the astronauts' shed skin during their long periods of time working in space. The shed skin found its way into the nooks and crannies of the Space Lab and Mold grew on them. The human body sheds a layer of skin every month. This is normal and another way that our bodies cleanse themselves periodically. Mold grows on shed skin that is on our clothes, bedding and places where skin and spores have landed. The best way to reduce Mold and Mold Spores on fabrics is to wash them often. Use a detergent that contains borax in it. Remember, Mold can start growing within a couple of days.

Body Parts and Organs - Mold has been medically diagnosed as growing in our sinuses, brain

tissue, lungs, liver, eyes, ears, under toenails and on the skin. The human body cannot defend attacks from many foreign substances on many fronts all of the time. Somehow, someplace and sometime, our bodies will become affected by Mold spores and or Mold. We can only hope that fungal attacks on our bodies will be minimal.

Sports drink bottles - The plastic bottles used by our children in any of the sports that they play are sometimes used over and over from week to week. After every use, they should be washed, rinsed and dried out thoroughly. If straws are used, use new ones each time and throw out the old ones. Any sugared moisture that Spores come in contact with will eventually grow Mold. Drink bottles are given away in many places at many events for free. They are also cheap enough to be replaced, for the prevention of ingesting Mold or Mold Spores.

Hummingbird Feeders - A good and healthy way to feed Hummingbirds is to clean all parts of the feeders, especially their insides, in between fillings of sugar water. Mold can generally be seen within a week, on the inside of the bottle in the areas that the sugar water has receded from and in any area of the feeder that the sugar water comes in contact with. The Mold is usually darker in color to almost black. Bottle cleaning brushes can be purchased in most grocery stores and they will scrape the Mold off. Bottle cleaners are long twisted wires with a "brush" on the end of them that work well. Rinsing the feeders with hot water will not kill the Mold. It will however loosen it up so that it can be flushed out. Hummingbirds will drink from feeders with Mold in them, but they will choose a cleaner feeder when possible. Either they must have some type of immunity to the Mold or there

isn't enough scientific proof to know what happens to a Hummingbird after long periods of time from feeding on Mold infected feeders. To be safe, clean them out often and when the Hummingbirds have left the area for the season, wash and brush them out with a borax solution, rinse and dry them thoroughly. Store the feeders in a dry place in the off-usage season and Mold will be kept down to a minimum.

Coolers - Food and water coolers are wonderful places for Mold to grow. Have you ever opened a cooler and found Mold inside of it? If the cooler had been washed, disinfected, dried and left open during storage, the Mold wouldn't be there. Common sense should remind you not to store anything away, unless it has been thoroughly cleaned and dried.

Houseplants - Plants in our houses bring beauty and a little bit of the outside indoors. Molds can thrive on houseplants and in the medium (dirt) that they grow in. Your local feed stores carry various chemicals to kill mold on both the plants and in their dirt. However, killing the fungi in the soil will have detrimental effects on the plants. The main purpose of a plant fungus is to break down the different particulates in the soil and convert them into nutrients that all plants require. This is accomplished by absorption through their roots. So where is the happy medium with indoor plants? It comes down to either having plants indoors and living with the potential of Mold and Mold spores or not raising indoor plants. It's your choice.

Toilets - This is probably one of the most frequently used households items that we all come in contact with on a daily basis. Toilets have many opportunities for Mold growth and it's not just because it is a source of continuous moisture. There is a water

line connection used, but most problems are caused due to the leaking wax ring seals. A wax ring seal is made from wax and when properly installed, it provides a seal between the bottom of the toilet and the drainage flange pipe. The seals, toilets and flanged drain pipes are standard sizes, so a standard size wax ring seal will work fine between most interconnections. This is provided that there isn't any water damage to the surrounding floor and that the toilet was installed correctly. If the seal is broken and sewage waste/water leaks from many flushings in between the floor and sub-floor, then Mold will fester for weeks, months and even years, unnoticed. These types of Mold problems are usually very serious and can cause major health problems to our families and our pets. Periodically, inspect for any water damage around toilets and under the floor if possible. Prevent Mold from germinating if water damage has occurred. Quickly fix the problem, and ensure that the area is dried out prior to replacing a toilet. If not, then Toxic Molds can become your worst nightmare.

Air Ducts - If you have a central forced air heating and cooling system, then you have a haven for Mold growth and Mold spore populations. Just imagine how many cubic feet of air are circulated throughout your air ducts and house when the unit is operational. Every time the unit is blowing air, Spores are spewed around and recycled continuously until the Spores settle down or are inhaled by our lungs through our noses and mouths. There are ways to reduce the Spore count in forced air systems. Newly installed systems are the easiest to get a jump start on Mold and Mold Spore reduction. There are products on the market such as air filters and electrostatic filters that can trap small airborne particles, but Mold Spores can

be as small as one micron wide and filters to trap these particulates are very expensive. It may be impossible to install such filters in older systems or your current system. UV lights systems can also be retro-fitted into your current duct work. Combining filters and UV lighting into your current system for the square footage of your house, can make a big improvement to your IAQ. For people who are susceptible to airborne particulates, forced air systems are not the best way to heat and cool a house. Electric heat, radiant heat or hot water pipe boiler systems are better from the standpoint of Mold Spore distribution, but they each have their individual drawbacks. Electric and radiant heat are expensive to operate. However, the cost to run these units should not be a reason to deny your family a healthy living environment, that is unless you absolutely cannot afford it. Hot water boiler systems have the disadvantage of creating leaks in various places in the house due to the layout of the pipes. Find the system that works the best for your situation and location.

Paint - Molds feed on the minerals and on the oils in the paint, and causes the paint to discolor. Paint is like candy to Mold. If you have Mold, do not paint over it. It may look fine for a while, but all you have done is give the Mold more food and just camouflaged the area temporarily. Actually, the Mold problem will become worse than it was originally, for it will grow deeper into the materials, behind the paint. The Mold will eventually cause the paint to peel off, leaving an ugly blotchy mess.

Garden Hoses - The next time you want a drink of water, and you're outside, do not drink out of any hoses hooked up to faucets. Besides Mold potentially growing inside, what other bacteria, bugs or whatever

else, can get inside the damp hose is anyone's guess. When hoses are not in use, water can remain in them for long periods of time. Store your hoses after you have drained them thoroughly. This will help cut down on bacteria and Mold growth.

Tents - Have you ever gone on camping vacation only to find the tent is full of mold on the surfaces, when you erected it? This is not the best time to find Mold. What should you do? Maybe you should sleep under the stars! Sleeping in a musty tent may not be a good idea. It should be washed with a borax solution, rinsed and dried thoroughly prior to usage. Do not store a tent in its bag until it is completely dry, and make sure it is stored in a dry and well ventilated area.

Leather items - When any type of leather products, such as jackets, belts, shoes, baseball gloves and a host of other items, get wet, they are subject to Mold infestations. Usually these molded items should be thrown away. If the Mold infestation is minor, a professional dry cleaning may be your best answer in saving the item.

All of the above mentioned Mold Food items are just a sample of where Mold can survive, if given the right conditions. Keep vigilant of potential mold-prone areas in your travels throughout your daily lives. After a while, common sense will trigger your brain cells into doing the right thing to prevent Mold from growing on various Mold Food items.

Mold Inspection

Houses are probably the largest single monetary purchase most average individuals make in their entire life. Isn't it prudent to make your Home, and keep it, a healthy Indoor Air Quality (IAQ) environment in which to live and raise your family? Most Molds are really the result of negligence or ignorance of the subject matter. Education is one of the keys to our living healthy lives. Basically, "Common Sense" and "Awareness" are your cheapest weapons in protecting your investments.

Finding Mold in your house is really not a difficult task for the common homeowner, landlord or any reasonably intelligent layperson. However, it is one thing to find Mold and another thing to fully realize the total scope of the problem and properly remedy the situation. Look at your inspection as if it were a "Crime Scene" and take a Forensic Science approach to not only finding the Mold, but equally important, to finding the source or root cause of the Mold infestation. The Engineering term is called RCCA, Root Cause and Corrective Action. Find the problem and correct it the first time. You're looking for a source of moisture or water. You should get educated and learn more, but not necessarily by paying a thousand dollars or more to attend a weekend seminar taught by a Professional Mold Inspector. : though that wouldn't hurt if you can afford it.

If you do find Mold in your Home, don't panic or get hysterical. Assess the situation yourself, prior to hiring a Certified Mold Inspector. They can be found in the Yellow Pages, that is, if you can find one in your area. Your local Department of Health may be able to

recommend someone with reputable credentials and expertise in Fungi or a business that specializes in IAQ, that is Insured, to protect both you and them. A person who is insured, is basically a person who carries a Liability Insurance Policy. The coverage will vary from State to State and Insurance Company to Insurance Company.

Mold services are not cheap, but what is your family's health and your investment worth? A Certified Mold Inspection can run \$250 to \$2000 for just a professional inspection and report of the findings. A Protocol Plan for Remediation, Testing and Remediation are additional. The inspection charge varies from Contractor to Contractor, largely due to the size of the house and the distance away you live from a Mold Inspector. The reason for the initially high Inspection cost is due to a few factors. First, a good Certified Mold Inspector must have a vast knowledge of the subject matter. This is education for which the Inspector has learned and paid for. Ask him for his credentials. Second, A Mold Inspector should arrive at the scene with all the equipment he needs. If he forgot something and has to order it, be wary, he is not prepared. High Tech equipment, such as a Moisture Meter, Digital Temperature & RH Meter, Air Sampling Pump, Culture Plates, Mask, Sterile White Suits, Gloves, Duct Tape and a few other things must be used. The White Suits, Gloves, and Tape to seal the clothing together are throw away items after each job. Many items need to be replaced. The initial cost for all this equipment can exceed \$2000. Some larger Environmental IAQ firms can provide a "one stop shop" business, but most likely, they will be from out of town and that will be factored into the Inspection charges. Typically, an Inspection is not an estimate to

fix your Mold problem, but it would define to you how extensive your infestation is and if very minor, how to go about correcting the situation. The Inspection charge could also be put towards the Protocol Plan or Remediation costs when negotiating a contract. Try to get as much for your money as possible. Each test that uses a Culture Plate to collect and have airborne Mold Spores analyzed, will cost \$100 +. The Spores that have been inoculated into the Culture Plate are allowed to grow as it is sent on its way to the Laboratory for a detailed analysis and a report of its Genus and Species. The US Government does not allow Mold or Mold Spores to be shipped via the US Postal Service. If caught doing this, there are heavy fines levied.

You can also search the Internet for "Black Mold". You will get a hundreds of "hits" and then you'll have to dig further until you find something on the subject. There are a lot of gimmicks and products out there that claim to kill Mold or Mold Spores. Most of them do not work! Read the labels for the ingredients.

Common sense and a little knowledge are the initial tools you need to do a preliminary inspection for Mold. Once you have confirmed the existence of Mold, can understand and estimate the amount of infestation/damage, then it will be easier for you to discuss your problem with a Mold Inspector or an IAQ Professional, if needed. The following are tips and the most common ways of finding and making judgment calls on what to do about Mold found in your Home.

1. Smell - When entering a room, use your nose and smell for a mildew, mustiness or an ammonia-like odor. After the initial detection of an odor, you might want to put on a mask to protect yourself from inhaling too many Spores, especially when moving

things around on your inspection tour. Mold Spores are released when disturbed. Walking past Mold provides enough air turbulence to set-off Spore activity into the air. It doesn't take much energy to get Mold spores airborne. Most Mold Inspectors will put on a respirator as soon as he gets his first whiff of an odor or if knows ahead of time through the pre-inspection interview, that there is a Mold problem. Many times, especially in heavily infested areas, the odor of ammonia or mustiness is quite apparent. Ceilings and basements are notorious for this and these are the first signs of a potential problem. Often, it is difficult for an individual to smell the odor of Mold if he lives in that environment on a daily basis. Our nose adapts or becomes accustomed to, and will not recognize common scents or musty odors. Our nose has been designed with sensing receptors that will block out common or routine odors after a period of time. It is like walking into a house and immediately knowing, by an odor, that there are smokers or cats in the house. The occupant is usually oblivious to the odor.

2. Look - Slowly and carefully look for any signs of discoloration on the walls, floors, ceilings and in corners of all rooms, basements, cellars and in garages. Since moisture is usually the culprit, stains are good clues as to what may lay behind or underneath those areas. Spores + Moisture + Mold Food = Mold. When a stain, water damage or Mold has been found, the next step is to find the source of the problem and correct it immediately. This cannot be stressed enough. Remember, Mold growth takes place rapidly within 24 to 48 hours of spore inoculation.

You can assess the amount of damage/infestation to determine the steps you need to

take for Remediation, per the following general guideline:

1. Less than 10 square feet of infestation is considered a "small isolated area".
2. More than 10 square feet and up to 30 square feet of infestation is considered to be a "mid-size isolated area".
3. More than 30 square feet of infestation is considered to be a "large sized area".

If you have 10 or more square feet of Mold infestation, a Professional should be consulted. Anything less than 10 square feet can usually be remedied by the homeowner, relatively inexpensively with the proper Protocol Plan, precautions, techniques, equipment and cleaning supplies.

During your Inspection tour be aware of potential sources for Mold growth such as old dried up water stains, and ensure all air intake and exhaust vents are operational and not stuck open or shut. Dryer vents often get quite a lint build-up on the exhaust trap door and the moist air can be diverted back inside the house.

If you use outdoor water sprinklers on your property make sure they do not spray on your house or alongside your basement walls for obvious reasons. Water can leach down along the outside of the basement walls and find its way through the cracks and inside your house.

If Mold behind a wall is suspected, then only a trained professional has the equipment to perform this investigation without tearing a wall down. Prior to drilling any holes in the walls, and sticking a probe in them, a good Mold Inspector should have asked the client "when was this house built"? This is very

important, for prior to July 1st, 1985, asbestos was allowed in construction materials. Prior to Jan 1st, 1978 lead was allowed to be formulated into paint. Due to the fact that airborne asbestos and lead paint dust are hazardous to our lungs, it is not advisable to start arbitrarily drilling holes in walls. There is a technique used by Inspectors, though not highly recommended, to spray a foam, like shaving cream, on the area to be drilled and drill through it. This contains the dust and can be wiped off after the inspection. Asbestos was used extensively in 4X8' sheets of Dry Wall construction materials. Canada still allows the use of asbestos in Dry Wall Sheets, so be careful if your materials come from our northern neighbor. Asbestos removal is expensive, a typical Contractor price is about \$8 per square foot. Lead paint can be tested by purchasing a kit. It should be available in many National Hardware Stores. The kit defines the process to test for lead by first roughing up the paint in an inconspicuous area with wet sand paper and allowing it to dry. A gel is provided that is rubbed onto the roughed up area. Instant results are seen right in front of your eyes. The test area will turn a shade of green in about a minute, if lead paint had been used.

If there is no asbestos or lead in the wall construction, then 1/2" diameter holes need to be drilled to allow the use of a Fiber Optic Inspection Device. This is a lighted, flexible 18" scope that is inserted into the wall and viewed with through an eyepiece. A professional is looking for any signs of water damage or Mold problems. More holes may be needed to be drilled if an infestation has been spotted or the area drilled cannot be viewed due to "firewalls" inside of studded areas. Firewalls are basically a cut piece of lumber that is fitted between studs. This

prevents fire flames from rapidly spreading vertically through the adjacent floors. Your local Government has defined these requirements years ago.

A professional will always fill the drilled holes up with a spackling compound when finished. This is to prevent any particulates from coming out from behind the walls. A Mold Inspector is not responsible for sanding or re-painting the wall; that is the responsibility of the homeowner and it should be spelled out in the Contract for Services.

Thorough Inspectors will numerically label the areas tested and usually take pictures for future reference in case of litigation.

Another clue in walk through Mold Inspections is to open and close every door. If a door sticks or is out of alignment then potentially another clue has surfaced. Water damage can cause settling or shift hinged areas, thus hindering the proper door movement.

If no Mold is found then the Mold Inspector can inform you how to minimize your indoor air Spore count after he has performed his settling samples for Spore count testing, which is described in a following chapter.

A good professional Mold Inspector knows what questions to ask (usually a pre-defined form is filled out). He will also have high tech equipment to inspect with and knows how to test for Mold Spores and types of Mold. He is your best hedge in fighting a vicious enemy. A Certified Mold Inspector should be looked at as a public health servant and his job is to provide a healthy environment in your home and guidance with Mold problems. Mold Inspectors are like Dentists: people hate to see them, but they are

required for maintaining your beautiful and healthy smile.

Your house is not the only place to inspect for Mold. Your workplace and schools are also places where we spend a lot of time. There have been many reports with Mold problems in these places, especially with schools and our children's health. Once you start looking for the Mold, you will be surprised at what you find and where you find it.

Again, use common sense, practice preventative maintenance and store your stuff in an orderly manner (in case you have to move them in a time of a water emergency). Keep your eyes open and your nose sniffing when you walk around your house or in suspect areas. In this way the threat of Mold should be reduced to minimal levels and not invade your household with toxic airborne particulates unless you ignore the warning signs!

The following are pictures of Mold on the Dry Walls in a basement. In this vacated house, the water pipes broke during the winter. Less than six months after the water was turned off, Mold had infested the entire basement. The estimate to clean up the Mold far exceeded the value of the house. The house had to be torn down and hauled off to the dump. This is a relatively common site to Inspectors, when a house has been neglected for months after water damage. This is also the result of houses that were in floods. How many areas of the U.S. have been hit by storms that caused flooding? How many of those flooded homes were properly Remediated? Many flooded houses acquire the Sick Building Syndrome, with heavy Mold infestations, especially if they are not cleaned up immediately.

Pic #

Pic #

Pic #

Mold Testing & Sampling

Testing for Molds can be done by both the Homeowner or a Professional Mold Inspector. There are quite a few different “Mold Test Kits” available in Stores and over the Internet. If you are going to attempt this yourself, choose a kit that will give you the results you want. Buying a kit without understanding what it will provide you is like throwing your money away. You need to understand what type of information the kit will provide, for what you want to accomplish. Buyer beware, you get what you pay for. Mold is potentially a serious problem and should not be dealt with haphazardly or irresponsibly.

A good Mold Inspector will know exactly how he would approach testing, and the methods to use, based upon his knowledge and expertise. A thorough Mold expert will have performed multiple tests in the house by collecting airborne Spores and Mold on surface areas for Laboratory analysis. In this litigious world of today, an indoor airborne Spore count and an outside airborne Spore count, used for control purposes, are the first answers needed for questions posed in testimony on Mold related litigations. But is this the correct method?

An informed and continually educated Mold Inspector knows that there are two types of Mold Testing methodologies that can be accurately performed: Viable Testing or Non-volumetric air sampling and Non-Viable Testing or Volumetric air sampling.

Viable Testing or Non-volumetric air sampling is the growing of Mold in Petri dishes containing a fungal growth medium. These Petri dishes are known

as Gravity Plates, Settling Plates, Sedimentation Plates or Culture Plates. This type of testing technique is used to obtain preliminary and qualitative information, which may not yield or result in very useful data. However in other situations, it is very useful. An example of its usefulness would be in the food preparation/packaging industry, for Mold Spore air quality monitoring. The Mold growth in the Petri dishes is used for microscopic analysis by qualified individuals. These individuals, usually with education in microbiology (backgrounds), are trained to provide the human element needed to accurately identify Spores to a Genus and even to a Species. The Spores will start growing sometime within 24 to 48 hours, or more for some Species. In that time, while periodically monitoring (looking through the top of transparent culture plate) the area where the Spores landed, you will start seeing the individual Spores colonizing. The number of colonizing Spores are counted, recorded and extrapolated with a mathematical formula, to calculate the number of airborne Spores in an area/room at any one given time or for use in Genera identification. Insurance Companies and Attorneys require outdoor control Spore counts as baselines, in testimony, as well as the other individual indoor Spore count tests taken at the same time. Mycologists typically look at the Spore size, shape, color and growth patterns amongst other characteristics to identify Mold to a Genus and Species, if possible. Even though there is no central data base to define every Species of fungus, enough is known and there are commonalities within a Genus for identification. That is what specialists are trained to do and what they are looking for. Practice makes perfect ! A Laboratory that has been around for years, has hopefully built up the expertise needed to provide a 7

to 10 day response time, and an accurate analysis. Results provided by a Laboratory in a couple of days will not be accurate. Some Species of Mold take more than two days to grow or fully colonize. Therefore some Molds will be missed in the analysis.

Viable Testing can be an important test in Mold identification, however, it has its limitations. First, many Molds will not grow in any fungal growth medium (agar), so it is often difficult to determine which medium to use/purchase. Second, some Mold Spores are not easily airborne due to their size/weight (species of *Stachybotrys* are good examples of this). The third limitation of culture plate analysis of Mold is that some Mold growths will produce non-sporating Mold growth. Without Spores, a Mold cannot be positively identified. On the positive side, Viable Testing is a method to determine Spore count, along with determining Genus and Species of Mold(s) that have grown in an agar solution via culture plates.

Pic #

Agar, as it is commonly called, is a fungal growth medium nicknamed "Mold Jelly" or "Mold Food". It is usually purchased pre-prepared. It is liquidy at first and then sets up to a non viscous (thick

& non-flowable) form in about 45 minutes, prior to air sampling. Refrigerated, premixed and quality controlled culture plates can also be purchased thru the internet, a Mold Inspector or directly from a Laboratory, provided you know what to order. The medium is then inoculated with Spores, properly collected, at the time of inspection. The airborne Spores are caught in the settling plates in a pre-prepared room environment and are strategically placed in that area for a 15 minute time period (standard time, but the time could be longer, as long as it is recorded). The cover plate is placed on top of the bottom culture plate when the 15 minute time period is over. A wide enough piece of good electrical or cellophane tape is used to seal the two plates together. The bottom plate is then labeled with information required for Laboratory testing, ie.. Name of Inspector, Client ID, date, sample # , and all of the other information needed in a proper form. The accompanying data sheet form must correspond exactly to the information on the Culture Plates. This is critical, for any incorrect entry will only delay the results, and cause confusion to both the Laboratory and to a jury, if it were used in a lawsuit. Viable testing is a scientifically repeatable test but it must be performed and recorded with extreme accuracy or the results can be inaccurately used, tainted or misleading, and a reasonable doubt will be created.

Another type of Viable Testing is Swab Testing. This test is performed by purchasing a kit which contains a sterile swab and a buffer medium in a long capsule that has a screw off cap. The area to be tested is gently swiped with the swab that has been pre-dipped in the buffer solution. The swab with Spores on it is placed in the supplied culture tube and the cap

is screwed on and sealed. The unit is then immediately, within 24 hours, mailed in, and the Laboratory will continue to grow the sample until ready for microscopic identification. A typical Culture Plate analysis costs from \$50 upwards to \$150 per sample or more, depending upon the analysis that is offered. The analysis should be faxed to the tester after about 7 to 10 days, and followed up by a "snail mail" report. This cost is relatively reasonable considering that a blood DNA sample can cost from \$500 to a couple of thousand dollars, and take up to 6 weeks for results, unless it has a high priority or a high profile case.

Laboratory costs are very expensive to the average homeowner and may not even be necessary. The main problem in Mold cases is what is required, and/or what is necessary, depending upon a situation or the purpose that it is to be used for.

If the submitted sample results are analyzed in a day or two after inoculation, premature Laboratory analysis/results will be obtained. Some Molds grow slower than others and an analysis of all of the mold growth in a Petri dish, must be thoroughly performed. Basic air sample testing is the standard, in the current litigation process'. But this is not enough, and it really doesn't provide accurate test results per every situation. Hopefully, the time will come, in the near future, when knowledge and facts will dictate the correct testing methodologies and standardized results will become accepted and embraced by all parties involved with Mold. Unfortunately, this will probably not happen.

Another Viable test in determining the Genus and Species of Mold is Surface Sampling or the Tape Lift Test Sampling method. This is one technique of

testing when Mold is visible. With gloves on, a piece of transparent tape is carefully placed on top of the Mold and lifted off. The tape lifts off pieces of Mold growth and then the tape, with Mold on it, is placed on a piece of wax paper or inside a zip lock container defined by the Laboratory directions to which it will be sent. It is then packaged up and sent to the Laboratory from which the kit was purchased. The charge for this type of testing runs from about \$50 or more. There are various test kits on the market, so if purchased, follow their directions for proper Mold testing submissions to get the results that the Laboratory claim they can provide

A good way to identify Mold to a Genus and Species is for a Mold Inspector to perform the Tape Lift method on existing Mold growth, and having him ship it to a Laboratory for analysis.

The best way to test visible Mold is to have a Mold Inspector perform the Tape Lift method on existing Mold growth and for him to prepare a microscopic slide for immediate analysis. There are very few Mold Inspectors who are capable of this task and even fewer of those that can actually analyze the prepared slide under a microscope themselves. If you can find a Mold Inspector who can analyze Mold growth, you have found the "Best Of Breed" in the business. Only a person who has a great deal of knowledge of indoor Molds, and has been educated about fungi by Biologists, Scientists, or Mycologists can perform this service.

The following is a simple method for looking at a Viable Mold Sample, taken from actual Mold growth. This temporary slide preparation method works well for a “real-time” look at live Mold, growing at the home/location. The Mold shown in the Culture Plate is 10 days old.

1. Do not touch Mold with your fingers. Wear plastic gloves when preparing a slide.
2. Place a drop of water in the center of a regular 1X3 inch mounting slide.
3. Using a piece of clear tape, lightly press the glue side down, on the Mold, and lift it up. Do not overload the tape with Mold, you don't need much.

Pic #

4. Briefly touch the Mold side of the tape on the slide's drop of water.

Pic #

5. Turn the tape over and and place the tape on the slide, Mold side up.

Pic #

6. Place a standard 22x22mm cover slip on top of the tape/slide.

Pic #

7. With a tissue, lightly press down the slip on the slide and pat dry all around the slip. Be careful to keep the slip centered on the slide.

Pic #

8. Place the prepared slide “under the microscope” and starting with the lowest power, focus the Mold/Spores in, and move up in magnification until you get to around 400x magnification. With the help of this book, you may be able to identify some of the most common types of indoor Mold.

Pic #

Practically anyone who has taken a high school Biology class should be able to prepare a slide and look at it under a microscope which is capable of at least 400X magnification. However, identifying a Mold can be a very difficult, to an impossible task, to an untrained individual.

Non Viable Testing or Volumetric air sampling is a type of testing in which Spores are collected, via a few different methods, and the results indicate the presence of Mold Spores in the air and a rough Spore count. This is good information, but it doesn't tell the whole or proper story either. There are various methods for obtaining an airborne Spore count: the Culture Settling Plate method, already described, and the Grab Sampling method (air and carpet sampling) are two of the most common. The Grab Sampling

method is performed by the use of a controlled Air Testing Pump, with a calibration unit and with proper intake cassette attachments. The Air Pump is also called an IAQ Air/Carpet Sampling unit or Aerosol Testing. Both the Grab Sampling method and Culture Plate testing collection methods can be Laboratory analyzed for Spore count and/or Spore inoculation testing. To be able to fight off Mold and Mold Spores in our bodies and our houses, we need to know what the Mold is. This information gives clues as to how to remedy a situation. The Aerosol Testing air pump grabs a sample of the particulates in the air, and they are deposited on a slide in the cassette, which is then analyzed under a microscope. A Laboratory technician then proceeds to count every Spore he sees by a defined standard method. The Spores counted on the special sample slide are then used to mathematically calculate, in a cubic meter of air volume, the amount and type of airborne Spores in a given area/room. Human error can easily be a result from this process for many reasons. A technician literally has to be aware of how to differentiate between what is a Spore, types of Spores, dust, insect pieces, pollen, paint flakes, bubbles and many other items/particulates grabbed. While doing that, he has to know where to start and end the count on the slide (vertically and horizontally), simultaneously tabulating the count using a handheld thumb triggered counter. Mistakes will be made.

The cheapest "Do it yourself test kit" is about \$10. You will get a small unit, which you place in a room for a period of time, according to directions. The result will be that the test indicates the presence of Mold Spores in the air. Not much to go on, for Mold Spores are everywhere, in various concentrations and various Species. These types of tests only provide a

small amount of information and can be worthless. That is why they are so cheap.

Even though there are currently no Federal or State Laws or Regulations or Guidelines, high Spore counts in a one hour testing time period, for a Culture Plate "Do it yourself test kit", should provide enough reason to raise a concern and reveal the need to hire a professional. He will confirm your results/supicions, determine if the testing was done correctly, decide whether more/different tests should be performed.

One sign of a good Mold Inspector is that he will take two Culture Plate samples per room, mark them and let the homeowner pick one to keep and watch grow. The other inoculated Petri Dish sample can/should be sent to a Laboratory for analysis. This technique is a good way for the homeowner to become more comfortable with the forthcoming Laboratory test results and to keep informed as to the Mold growth process of his own sample. A comparison can then be made between the two samples taken after the Laboratory results have been received back. If the Petri Dish that you kept has no Mold colony's growing in it and the Lab results of the sent in Petri Dish indicate 10 colonies grew in it, something is wrong.

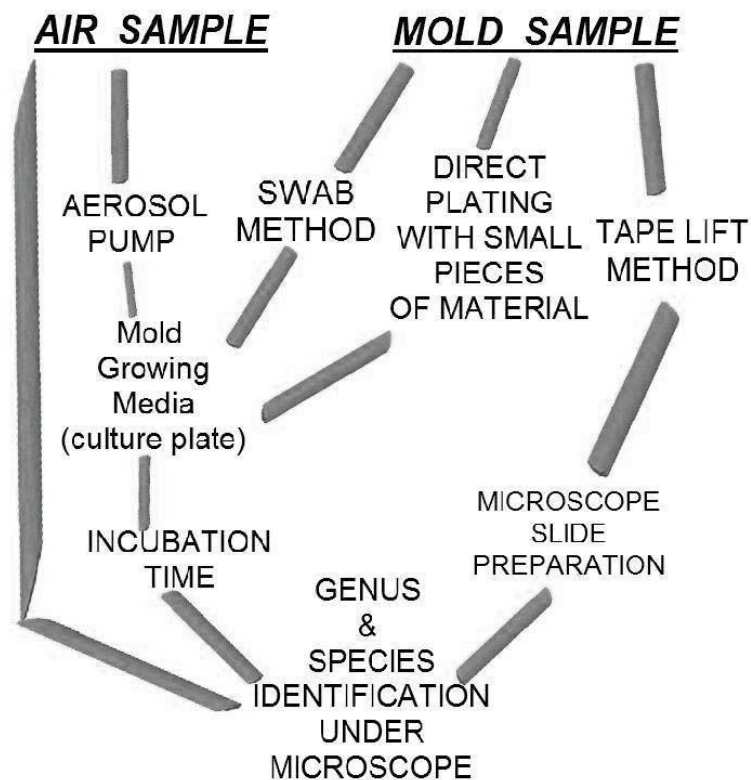
**In review, the following are key highlights of
MoldTesting and Sampling;**

1. No one test can provide all the answers in Mold identification or degree of Mold infestation.
2. Viable and Non Viable Mold testing methods are limited in the information that can be attained by each form.

3. The Tape Lifting method on visible Mold is the most accurate form of testing to identify Molds to a Genus and Species.
4. Mold testing is not always necessary or needed, due to the existence of visible Mold. In other words, if you know you already have Mold, then why test for it, unless there is a valid reason (like continuous respiratory problems of a resident or a family member, whose symptoms cannot not be pinpointed to an exact cause).
5. Knowing what the Genus of Mold is, can have some meritable benefits. A Mold analysis can actually aid in determining the method of Remediation, for the Remediator. It can also provide another piece of a puzzle in dealing with health problems for Homeowners and their families.
6. Do your homework prior to hiring a Mold Inspector. Ask for qualifications and insure that the Contract you sign will provide the information you want.

Mold Spore & Mold Sampling Methods

(simplified versions)



Protocol Plans for Mold Remediation

When Mold is found indoors a plan to get rid of it and keep it from coming back must be established. If the Mold problem is a typical house cleaning chore like Mold in a shower, then the Protocol Plan is rather simple. If the Mold has infested an entire basement of a home, then an assessment of its value in relationship to the clean up costs must be weighed and a Protocol Plan must be devised around the desired end result, or money available. The two examples are at the extreme ends on the spectrum of Mold infestations. Most Mold problems fall somewhere in between and each infestation has to be dealt with on an individual basis.

So what do you do if you found Mold in your shower stall? Big deal, most of us have already experienced this and we probably just grab the nearest tub and tile cleaner or bleach, and rub it on the moldy area and wipe it off, then throw the clean-up rags in the waste basket. We should do a better job than that! First, knowing what type of Mold it is can be important for some people; to others it is just a nuisance. Obviously a person will not expect to dish out hundreds of dollars to a professional Mold Inspector to be told that you have just a common shower stall Mold and how to clean it up. But when you do clean the Mold up in a shower stall, you should at a minimum, ventilate the area, wear a basic white filter mask & rubber gloves, old long sleeve shirt and long pants. Use a borax based detergent as a liquidy paste or in the standard borax solution (1 cup of borax to 1 gallon of water). Do not use bleach on a rag to clean up the

Mold. Always use throw away rags or paper towels. Place the used paper towels in a plastic zip-lock bag and dispose of it in your garbage. Do not throw them in the garbage can inside the bathroom. Get the soiled stuff outside the house. Incidentally, it takes at least 30 minutes to kill or disinfect Mold with a fungicide. Let the shower stall dry completely prior to the next usage. This prevents the residual cleaning solutions from being washed right off. If left to dry, there is a better chance of killing the most Mold possible, depending upon how thorough the clean-up was performed. Next part is to try to prevent the Mold from coming back. If you really don't want Mold in your shower stall again, then prevent it from happening by cleaning more often and ventilate the bathroom. Basically, what was just described is a simplified Protocol Plan. It basically is common sense.

A professional Protocol Plan is usually devised by contracting out to a Specialist or the Mold Inspector. This is not part of the Inspection fee, unless agreed upon by both parties, the homeowner and the Mold Inspector. Thorough Plans require a discipline in laying out a problem and logically unlayering the situation, from start to finish for Mold removal, Spore reduction and future Prevention.

The cost of a typical Protocol Plan for a medium to large size Mold infestation can run from \$400 to \$2000 +. This does not include the cost for Remediation or the follow-up Clearance Testing to verify the clean IAQ after Remediation. A contract should be in writing and signed for the development of a Protocol Plan.

The Bottom line is that if you have a small Mold problem, then think about what your going to do before you jump right in and take the easy way out.

The easy way usually doesn't work with Mold; it will come back and in the mean time you are inhaling excessive Mold Spores in your confined home. If you have a medium size Mold problem, more than 10 square feet, then you need guidance before you just start scrubbing the walls with bleach.

Do it right the first time! Seek help, don't get over your head and cause more problems and make matters worse than you originally had to start with.

Mold Remediation

If Mold is found in your Home, then a Protocol plan to remedy the situation as soon as possible is in order. Depending upon what was found in the Inspection will determine what Protocol Plan of action needs to be taken to get rid of the Mold and provide a healthier indoor living environment.

Organizations have different descriptions of levels of Mold Contamination. For instance, the NYC Dept. of Health defines 5 different levels of abatement. For simplicity purposes, three basic Remediation categories in which all Mold problems can be classified under will be described: Small, Medium and Large Infestations. They can be distinguished apart by the amount of square footage of infestation. A Small Infestation is the only size of problem in which an untrained individual should remedy and fix the situation. The other two categories, whose sizes of infestation are larger, should only be Inspected, Tested, Remediated and Clearance Tested by trained professionals. There is a big threat of making things much worse and spreading Spores throughout a wider area, if you don't know what you're doing.

Remediation Categories:

1. Small Infestations - Less than 10 square feet of infestation is generally considered to be a "small isolated area". So typically how much is 10 square feet? Well it's a 5 foot x 2 foot area. A typical door is about 3 feet by 7 feet or 21 square feet. So, if you have an infected area of approximately the size of a standard door or smaller, then this category fits your damaged

area. A good example in this category are bathroom shower stalls. Shower stalls typically do not grow Toxic Black Mold in the grouted areas. Mold in these areas become worse when not cleaned properly on a regular basis. These types of Molds are usually more visually annoying than anything else, except for people who are susceptible or allergic to foreign contaminants. To remedy common household Mold problems, follow the previous Protocol example. Our lungs don't need any more pollutants than we already take in, on a daily basis.

2. Medium Infestations - More than 10 square feet and up to 30 square feet of Mold infestation is considered to be a "mid-size isolated area". In relationship to a door, the size of this outbreak would be approximately the size of a door to about the size of a 4X8 foot sheet of plywood. The standard protective gloves and a mask for a small infestation are not good enough to clean up Medium Infested areas. Better masks/breathing apparatus, rubber gloves, full length white hooded suits and protective foot gear are required for the technician performing the service. If you were in this business, wouldn't you want to wear good gear to protect your lungs and body after repeatedly working with this nasty stuff?

3. Large Infestations - More than 30 square feet of infestation is considered to be a "large sized area". These are serious jobs that would require whole walls to be removed or the building to be demolished.

The four steps in the Remediation Process are:

1. Test for Mold and Mold Spores
2. Kill the Mold
3. Remove the Mold
4. Prevent Mold from returning.

A good Certified, Licensed, Insured and Bonded Mold Remediator will be in compliance with the “American Conference of Governmental Industrial Hygienists” for Mold Remediation techniques described in Chapter 15 of the book, which costs \$175.

The following are guidelines that should be followed by Professional Mold Remediators:

1. A Contract must be approved and signed by both parties, including chemical authorization usage and the Mold Inspectors’ employed monitor to insure that the Protocol Plan is completely followed during the process.
2. All local municipal laws and codes must be understood and followed.
3. Kill the Mold with a fungicide/disinfectant before removal. This could mean “tenting the house” and injecting chemicals, creating a positive pressure environment for a period of time.
4. Use full body Personal Protective Equipment (PPE) during the Remediation process.
5. Remove all furniture, artwork, antiques and books from the work area prior to starting the Mold

removal. They should all be cleaned separately by professionals and individual Protocol Plans.

6. If necessary, contain/quarantine the whole infected area with a double layer of 6 mil plastic sheathing and duct tape for an airtight work area. Plan the most direct route in the house for easy transportation of bagged materials out of the building. To get in and out of the work area, use big and long zippers duct taped to each layer of the plastic sheathing. Carefully, make a vertical slit in the plastic thru the zipper openings and your doorway appears.
7. Use industrial strength HEPA Filters and dehumidifiers during Remediation. Create a temporary negative pressure work area by employing a “push-pull” fan/filter method. Use one unit to push the air in from the outside and another fan to pull the air out of the room, located at the opposite sides of the room, if possible. The push unit should be set higher than the pull unit. This creates the negative pressure.
8. Use the double plastic bag method for infected material disposal. Cut or break big pieces of material into manageable size pieces, place them in a big zip-lock bag and then place that bag into another zip-lock bag.
9. After all the Mold has been removed, a fungicide/disinfectant is sprayed on all remaining areas. It is allowed to dry, and HEPA vacuumed up, then the process is repeated again.

10. After the 2nd coating of fungicide dries and is HEPA vacuumed, spray on an antimicrobial coating to all areas. Allow to dry and repeat again. This is to prevent future Mold growth for up to ten years of the best protection possible.
11. Overkill in all processes during the Remediation is the only way to ensure thoroughness. A few double bagged samples of the removed materials should be photographed and filed/stored away for at least a two year period or unless needed as evidence.
12. For medium and large Mold infestations, clearance testing should be performed prior to the homeowner being permitted to return. Once the doors and windows are opened and people traffic is allowed to enter and exit the dwelling, Mold Spores will re-enter and testing after that will give false readings as to the Remediation job that was just performed.
13. After Clearance Testing has been successfully completed, the next step is to inform the homeowner of his responsibility to keep the environment in the house as "Mold Free" as possible. This includes Subscription Testing, which could be a two year Plan (again, this is to be written and agreed upon in a Mold Inspection Contract) for airborne Mold Spores using the Culture Plate Test and Laboratory report.
14. Follow the Protocol Plan. If it called for, ensure that the carpets and duct work have been properly cleaned and completed prior to the removal of the

Mold in the contained area. Never have one done without the other.

Mold Cleaning Equipment

There are many different cleaning solutions and pieces of equipment used in cleaning up of Mold. Many of the items have already been discussed and used as examples in prior chapters.

There are two different kinds of disinfectants, a Sporicide and a Fungicide. Sporicides kill Spores. Fungicides kill Molds and most can also kill Mold Spores. Contact your local feed stores or an environmental contractor for aid and always read the labels for chemicals used in the products.

All Mold and Mold Spores should be killed prior to their removal. New products for cleaning and removing Mold hit the market every so often. Keep an eye out for them. Environmental friendly solutions for use indoors are in demand.

Never touch any Mold with your fingers. Always use protection from skin contact, inhalation and digestion of Mold.

High Pressure Washers can be used to remove Mold from wood, such as decks around houses. Then after drying of the wood, an anti-fungicide should be applied and dried prior to applying a surface coating to protect the deck from absorbing water and starting the infestation all over again.

Proper equipment is a requirement for inspecting, testing, and removal of Mold. The equipment, however is only as good as the person

using it. If used incorrectly, the results of Inspection and Testing can become tainted. Some test products must be positioned correctly in a room. For instance the standard for Aerosol Pump Spore Sampling is to place the Cassette 3 foot above the floor level and take samples from there. This is the area from which we breathe the most air. Initial training and repeated use of equipment provides a way to become an expert. However, most homeowners will not or cannot justify the price of buying equipment that will be used once or twice. Hand held Hidden Moisture meters are a cool 21st century high tech tool that can penetrate cellulose materials (not glass or metal) down to 3/4 of an inch, to display moisture levels, but can you afford to purchase one for \$500?

Good Mold Specialists know what equipment is required to do a job and they should have it in their inventory. That's why Mold problems are very expensive to diagnose and fix.

One of the largest polluters of indoor air particulates, including Mold Spores are the common vacuum cleaner. Most all vacuum cleaners pick up the stuff you can see, but the minute particles that are not filtered are released back into the air. It is amazing to see the results of tested units. A high-tech laser particle counter measures exhausted particulates on a particle per cubic foot (ppcf) basis. Unbelievably, the HEPA type vacuum cleaners spew out between 80,000 and 1,500,000 ppcf. The best vacuum cleaners sample between 0 and 1,000 ppcf's. However, these units are expensive (over \$500), but they're excellent and many hospitals use them!

Look for units that advertise: "99.97% Filter, removes 0.3 micron size particles", "ULPA Filter", "Allergy Type" or "Healthy". Read the fine print! At a minimum, purchase a HEPA unit rated at 99.97% in its filtering capability and it removes particles the size of 0.3 microns or larger. Why breathe in the stuff that is in the carpets? Try and filter out as much as possible. Keep the filters clean or replace them and empty out the bags frequently. Do not purchase a unit that doesn't have a sealed collection bag inside. The other type of vacuum cleaning system that provides an excellent method to clean floors, carpet and large rugs is the built-in central type. If properly installed, these units vent the exhaust outdoors, located away from any air intake unit, window or door on the house. This is probably the best way to reverse the normal trend of our houses being "Spore Banks", which is bringing in more Mold Spores indoors than are taken out of the house.

Mold Prevention

Preventing Mold from invading your brand new, just built Home or any other dwelling from an Apartment, an RV or to a Farm, can be the best thing to do in preventing unwanted health problems, allergy flare-ups and a host of other potential illnesses. Prevention can also increase your property house value, provided you can prove that your house is a "Mold Free" environment, based upon testing and certification. In New York State, a property disclosure law was passed in early summer of 2002, which requires the seller to divulge in writing and swearing that he knows of no problems that were not previously disclosed or any other problems with the home past or present. This will be discussed in a following chapter. This and other similar laws and regulations will be incorporated throughout the US, in time. Common sense and keeping an eye on your property, especially when there has been flooding, sewer back ups, water breaks or even during new construction using cellulose or wood based materials, such as moist 2"X4" studs, should become a natural thing to be aware of.

There are many things that we as human beings need to change in our daily lives in this new millennium, from Mold in homes to terrorist activities and being aware of suspicious behavior of people around our children, loved ones and neighbors.

The following are Mold prevention examples of what should be done during a new home construction. First, look at the lumber that you or your Contractor are purchasing, or using for your new construction. Why not be a little nosy? You're paying for it! If you see black, white, or stained looking areas on the just

delivered bundled studs, then question it. Or if the bundled wood is not protected with a tarp during a snowy or rainy periods, the wood can become Mold infested if not dried out immediately. Using the right chemicals, being properly equipped with body protection and using a little hard labor scrubbing with a brush, can clean and kill the Mold. Using a pressure washer or power sprayer on moldy stained wood, in the proper area away from any other wood based products, and drying them out quickly and fully can practically eliminate Mold on the wood. After the foundation and all concrete work has been completed, and the first piece of wood is placed, your new home could then become under attack by Mold. This will happen if the right (or wrong conditions, depending upon how you look at it) weather conditions combine with a lack of protection taken by you or a Contractor. If any moisture exposed wood is used or it has been exposed to rainy weather conditions, Mold Spores can find and land on the wet wood. If the wood is still moist and Spore infected, depending upon the timing of the framing up of the building, and the weather conditions, until the walls are plastered, your house can be infected before you move in.

Spores are virtually everywhere in our daily lives. We are, or have been exposed to many types of Mold and infestations of Mold in our lifetime. However, preventive maintenance is the key for potentially relieving many people of health issues. Every extra step should be taken, including getting tested for Mold allergies through your Physician. This is a way of maybe putting another piece of your health problem puzzle together and figuring out if you are having allergic reactions to Mold (i.e., sneezing when you enter a neighbor's house and you also immediately

smell a mustiness in the air, and the owners don't have cats.

The following are some more examples of common everyday things you can do to prevent Mold from infesting your home and disrupting your lives:

1. Eliminate any moisture or water problems immediately.
2. Use a dehumidifier in cellars or basements will keep areas dry.
3. Keep rooms/areas ventilated to aid in drying things out and reduce stagnant air.
4. Store things properly. Allow boxes and other stored items to breathe and do not place cellulose items directly on concrete floors.
5. After flooding, all items must be thoroughly cleaned or thrown out.
6. Prevent Mold from coming in contact with any of your body parts.
7. Purchase and use Relative Humidity meters in rooms to monitor the RH%.
8. Use of Ozone Generators can kill Mold Spores in your indoor air, but their use is NOT recommended due to problems associated with too much Ozone emissions. They can actually cause a black substance build up on walls that can be mistaken for Mold. Ozone emissions can also break down substances like

glue. How many places are glue used in the house? Construction materials such as particle board use glue, pressure and chips of wood in their manufacturing. If the glue were to break down, what would hold the chips together?

9. Use new Mold resistant materials such as special paneling in the construction of walls.
10. Use the new HEPA Vacuum cleaners for normal daily cleanup.
11. Clean the inside of your refrigerators often, especially after spills.
12. Check fruits and vegetables for any sign of Mold especially when older. When in doubt, throw it out.
13. Ensure that there are no cracks in concrete walls or floors, to prevent water seepage problems.
14. Do not put carpets or rugs on top of concrete floors. Use throw rugs and clean often.
15. Empty out the dehumidifier water holding trays frequently, or provide a direct drainage hose to a drain.
16. If you own an RV or travel trailer, after usage and when it rains check for leaks, especially if it smells musty or ammonia-like inside closets and storage areas. Most of the time leaks are from roof damage or cracked seams on the edges and worn out seals on doors and windows. Pullout sections are notorious for water leakage problems.

17. Fix all leaky sinks, drains, sweating pipes, roofs and other water associated products immediately. Toilet seals are of particular concern. The wax ring seal is a compressive unit that is sealed by fastening down of nuts on bolts. If not properly installed, water and sewage will find the gaps and leaks will start.
18. Beware of some products that make claims of eliminating Mold spores. The use of simple ionizers will not kill Mold spores or eliminate them from the air.
19. Close your windows when it is raining outside. Some Mold Spores become airborne when it rains. At other times, open windows whenever possible.
20. Close up all boxes of food, like cereals, when not in use. Properly put away food soon after eating. Also, keep caps on drinks when not drinking from them. These simple ideas may prevent Spores from settling on food stuff.
21. Use HEPA Air Filters and Purifiers to help in cleaning your IAQ.

There are other ways to prevent moisture and Mold from forming, so use your imagination and intuition and at least, start using the prevention methods as cited.

Federal, State & Local Laws, Regulations and Guidelines

As of 2002, there are No Federal or State standards, regulations or "Threshold Limit Values" (TLVs) for airborne concentrations of Mold Spores or Mold. There are however guidelines issued by the New York City Department of Health, the Environmental Protection Agency (EPA), the Center of Disease Control (CDC), the National Apartment Association, the National Association of Homebuilders, the American Conference of Governmental Hygienists, OSHA and other organizations. All of these can be found on the Internet through a Search Engine. This book will not get into the regulations for they can change/be updated continually. In time, indoor Mold will be regulated via legislation from Federal, State and Local State Governments as more situations arise and have to be dealt with. New York State now requires a Property Disclosure form to be filled out with 48 questions, to be signed by the Seller and witnessed, prior to or at the Property Closing. Though not specifically stating Mold, it is covered with the wording of damage and other verbiage. Knowingly selling a property that is Mold infested is now a violation of New York State Law. It is protection for the Buyer and a selling point for the Seller and could be big headaches for both. As usual, the attorneys will wind up making the big bucks off an environmental problem, Toxic Black Mold. Mold problems across the US, especially in Texas and California have and are

becoming more frequent. From famous Hollywood Stars to poor tenants, Mold knows no prejudice for whom it attacks. It is basically up to the Homeowner or tenant to find and deal with the problems, depending upon their situation. There is no one remedy for all Mold problems, as previously cited.

Large Insurance Companies are lobbying the lawmakers and pushing for new legislation to provide guidelines for Mold laws. Health problems related to Homes and other dwellings, including Schools are sparking a lot of different costly and very inconvenient problems. Mold can't be ignored any longer. Big money is involved and money talks. Washington and a lot of our other Legislative bodies from the Federal to the Local levels are being pressured from many fronts on how to attack this problem.

Changes will come, but it will take time. Until then, the "Mold Industry" and the public are going to provide the needed direction on how to approach Mold issues.

Building a New Home with Mold in Mind

If you are considering building a new Home, then you should be discussing special building techniques with your Contractor ASAP. Planning ahead will provide you with IAQ protection and efficiency. Mold prevention starts prior to the foundation being poured and is ongoing until all the walls are plastered. This is a very smart and prudent way to invest your money into your personal family's health and the building's increase in value through time.

The following are some ideas that will help prevent Mold infestations in new construction:

- ☐ Hire a Mold Inspector or another Environmental Professional to supervise the Construction materials and practices used. This could be the most important \$500 to \$1000 bill you might pay.
- ☐ Choose your building location carefully. Do not build in flood prone areas or where there is a lot of underground springs or where water settles. Good natural underground drainage lots are ideal locations to erect a house. In most states "perk" tests are required for sewage leaching prior to getting a building permit. You can discuss this with your local Building Code Enforcement Department.
- ☐ If your location is in the country make sure the lot is cleared out sufficiently of all trees and unwanted brush. We all love trees, but moisture

can be trapped in little eco-systems that we can avoid creating.

- Discuss the pouring of the foundation with your Contractor prior to starting the work. Floor drainage is important and maybe a below the floor sump pump is also a solution for your situation. The outside walls of the foundations can be water proofed/sealed by rolling on a special concrete black sealer/paint. Non Porous, closed cell foam insulation sealed around the outside walls will reduce the heat differential, thus preventing moisture problems. Drainage stone and pipes should be used and placed along the perimeter of the foundation to take water away from the building. Have your lot graded professionally. A landscaper has the knowledge of how much pitch is needed to divert water and has the right equipment to do the job correctly.
- Always inspect the building materials as they are delivered to your building lot. You are paying for it so you have the right to inspect its quality. Do not use any wood that is wet, damp or has black staining on it. Informing your Contractor of your intentions will also be a hedge against his accepting and using poor quality building materials.
- This next procedure could be the best money you'll spend for future benefits. Treat all completely dry lumber prior to framing with a borax fungicide, made for wood applications. Let it dry and spray it a second time. When that dries, spray all of the same lumber with a long term fungicide preventative that contains metallic oxides.

After the wood treated with fungicide has been used in the framing, spray with the fungicide preventative again. This whole procedure should cost under \$4000 for a single family home under 2000 square feet. This will kill all Spores and Mold that could be on the wood and it will inhibit the growth of Mold in the future. If you choose the right products, other benefits like termite, ant resistance and fire retardance can also be achieved in the same application.

- ☐ Plan on hardwood floors and no carpeting. Use throw rugs and clean them often, outdoors.
- ☐ Use a special concrete sealer, that protects from radon and water seepage into basements, on interior non painted floors and foundations.
- ☐ Use fiberglass insulation instead of the blown-in cellulose type.
- ☐ New products such as Mold resistance paneling can be used.
- ☐ Wrap all water pipes to eliminate condensation build up due to temperature differences of the water and the surrounding air.
- ☐ If forced air heating and cooling units are planned, then use only metal for the duct work/plenum. Also, the use of UV lighting units can be part of an "in line" unit that will kill Spores as they pass by. The lights will turn on and off as the system runs. The use of a good air filtration system is also essential in keeping the Spore count down.

- Use anti-fungal paint for ceilings and walls. This type of paint has a chemical additive in it that can be purchased from any good paint store.
- Ensure that your attic space and basement have adequate ventilation.
- Do not walk in a new house with shoes on. Shoes are great hosts for hitchhiking Spores. At the least, remove your shoes as soon as possible after entering your house, especially after walking on grass, dirt or near landscaping wood chips.

There are a lot of products that will emerge in the near future to control Mold in one way or another. Some will have merit and will help in prevention methods. Other products will do nothing at all. Beware of any “secret formulas”!

Mold in RVs, Trailers, Tents and Campers

There is more Mold in recreational vehicles, campers and tents than anyone realizes. In a campground in New York, an almost brand new 5th wheel Travel Trailer with “pullouts” (sections that pull out from the main trailer and make a room bigger) had gotten infested with Mold. The pullout failed to seal the water out during the winter and moisture entered on both sides of the pullout, near the floor. The carpet and the wooden floor under-layment were damp or wet for months. The problem was realized in the early part of Summer 2002. The strong musty smell of was overwhelming when the storage area under the dining room seat was exposed, when the owner went to look for something. The whole storage area, which was hidden from the outside world for months, had created its own little eco-system that was perfect for Mold growth. It was full of little black blotchy areas of Mold on the entire inside of the wood boxed frame and the bottom side of the plywood seat. The carpet inside the storage area was full of a light dusting of mold. The top piece (seat) of plywood was replaced, the carpet was removed, the entire area was cleaned with the standard borax solution (1 cup of borax detergent to 1 gal. of distilled water) and dried with fans, quickly and completely. After drying, a Mold preventative solution was sprayed over all of the Mold infested wooded areas. Since the Mold didn’t seem to have penetrated the wooden boxed pieces too deeply, they were not replaced, just washed. Sanding of the wood wasn’t a good idea, due to spreading of spores. This area is

now being watched every week to see if the Mold reappears. The exterior rubber seal moldings were also replaced to stop the leaking.

Skylights on the roofs of RVs are notorious for water damage on the ceiling around them. Skylights themselves can grow Mold on them and they can leak around the seams. It does not necessarily have to leak where the Skylight and the roof match up, but when it rains, people forget to close the skylight and water gets inside. From the floor to the roof, a mobile RV twists and turns when it is driven or towed down the highway, causing sealed joints to crack and then leak.

RVs also have sewer vents, gray-water vents, air conditioning units and TV antennas on their roofs. These are all prime areas for a source of moisture to enter the inside and start a Mold growth. When trailers are not in use, they should have their side windows left slightly open to permit air circulation. Stagnant air breeds Mold.

Just like houses, RVs have toilets, sinks, water lines, drainage traps and showers, all of which are great candidates for Mold infestations if a leak starts.

RVs are typically winterized by draining and blowing out under pressure, all of the water out of the lines, toilet, drainage traps and holding tanks. Some people re-fill their pipes with an "RV Winterizer", which is often pink in color. The theory is to dilute the residual water left in the pipes from freezing. The only problem is, that recently it was discovered that most winterizer solutions contain propylene glycol, a synthetic glycerine that it is like candy to Mold. So what is happening to all of the water lines in which people use to drink, wash dishes, etc.? Has Mold grown in the pipes? This subject will be investigated as time goes on. In the meantime there is no need to put

anti-freeze in the water lines. Blow out the water using compressed air into the water lines through the water inlet, located outside of the RV. A thorough job must be done by opening the lines separately. Open the hot water holding tank and drain/blow it out first, then open the furthest hot and cold faucets from the water inlet and blow them out. Move to the next faucet, etc., however, never add compressed air into any water piped system unless at least one valve or faucet is open. Keep putting air into the system until no more water comes out of each internal faucet or toilet. Also blow out the water in all of the drain traps. There is no need to use a liquid antifreeze in any of the pipes as long as all of the water has been blown out of the water lines and drain pipes.

Tents are notorious for having a mildewy type of scent when pulled out of their storage bag. Especially when it was placed in the basement and had been there since the last time it was used. When it was put away, was it thoroughly dry? Probably not. That is a good combination for Mold. Tents can be washed with a borax solution in a large tub. Erect them after washing and dry out thoroughly prior to storing.

Being aware of how things are stored is just good common sense. To prevent Mold problems, it can be as simple as that.

Questions to make you Think about Mold

The following questions are designed to get your mind thinking like a Mold Inspector. It is neither a comprehensive list of questions nor should it be used to run off and get hysterical and believe you have been infected by Mold. But if you can witness a series of events and watch them turn into a pattern, and they become almost predictable then you may be on your way to finding the cause of health problems. If symptoms persist then a question or two to your doctor can't hurt. It also may be the signal you need to look closer in your house for problem areas. If after thinking about your answers to each question, and they pose a thought, like a light bulb turning on, then follow your intuition. Look more closely into your situation.

Health related questions:

1. Do you feel like you can't quite get rid of the last cold or flu that you had?
2. Do you have any allergies?
3. Do your allergic reactions get better after leaving a dwelling?
4. Do your allergic reactions get worst when you enter a building?
5. Do your allergic reactions lead to asthma related symptoms?
6. Do you have flu like symptoms, headaches, soreness, etc. frequently?
7. Do you sneeze when entering a house or a room?

8. Do you have a running nose frequently?
9. Do you have frequent runny eyes?

House or dwelling related questions:

1. Does it smell musty when entering a house, room or basement?
2. Have you seen any blackish slimy substance on anything that is moist?
3. Did you have any water or moisture problems in your house in the past 10 years?
4. Did your house experience flooding conditions in the past?
5. Did you ever find Mold in your refrigerator?
6. Do you have rugs or carpets on any concrete floors?
7. Is all your stored stuff off of the basement floors?
8. Do you have any dark areas in your shower stalls or around your bathtub?
9. Do you have any stained ceilings?
10. Do you have any leaky faucets, drains or toilets?
11. Has your sewer backed up in the past?

Answering yes to any of the previous questions does not mean you have Mold, but there is a good chance you do, so don't ignore it.

Conclusions

Mold has been around for quite some time and man has basically adapted to it. However, in these times of litigation, advancing technology like DNA analysis and fields of Forensics, Mold issues are opening new doors of opportunity for entrepreneurs and specialists in the 5th Kingdom of Fungi. The more we learn through the Science and Medical fields, for or about our health and the potentials for what Mold can and has done, the more this new Toxic Black Mold industry/phenomenon is going to grow.

Threats of Mold to many individuals' health is real. There is a large portion of people in the world with allergies and individuals infected with HIV or have AIDS and they must be very careful of infections, no matter what the root cause is. Mold is just another variable in the health game of life. Mold infections in bodies can kill an individual if a series of circumstances come together. Mold to most people is just an ugly growth in the corner of bathtubs and shower stalls, that if wiped clean, it's gone.

Hopefully this book has opened your eyes about Mold, and its being a potential threat, to any family or home. Mold should be dealt with properly and immediately.

Mold problems can in some cases be blown out of proportion and "House Cooking" by criminal individuals is starting to pop up around the country. House Cooking is the intentional planting of Mold Spores in houses to show infestations, to cheat a client out of his money. It is pretty difficult to just pick a name of a Mold Inspector out of the yellow pages and be confident that you are dealing with a professional.

Ask for Credentials and do your homework. Most Mold problems are minor and with a little effort, practically anyone can approach Mold, with caution, prior to making things worse. It's now time to "Think Outside the Box" about Mold infestations and look at your problem from many different angles. Don't panic. Use logic and common sense from start to finish in correctly solving your particular invasion of Mold.

Summary

The heightened awareness of environmental pollution, along with the National and Regional News Media reportings, are the main reasons for the horror stories associated with the Toxic Black Mold phenomenon currently involving Homeowners and Tenants in the United States. This Book separates the hype from the truth about indoor Molds.

The truth falls somewhere in between the believers and non-believers about health toxicity issues and the abundance of Molds in our daily lives.

There are several truths about Mold and Mold spores:

1. Mold Spores are everywhere. They can be found in the air as high as 30,000 + feet above sea level to under the ground.
2. No indoor Mold is good Mold and it should be properly removed as soon as possible.
3. Mold found in any occupied dwelling can cause health related problems in many susceptible people. Those people and their homes should have their concerns checked out and tested for Mold infestations both inside their bodies and inside their Homes.
4. It is impossible to eliminate all indoor Mold Spores, unless you "live in a bubble".
5. If you find Mold in your workplace, report it.

Bottom line about Mold is that it is "Better to be Safe than to be Sorry", and hopefully this book will enlighten the skeptics about the dangers of Mold and inform the Homeowner on how to react if Mold is found.

Acknowledgments

After 40 years of an interest in Fungi, I have met many people who also share this common interest with me. I have learned much from many. This book is based upon everything I learned and was taught, by professionals to amateur mycologists, in the past four decades.

The people who first got me started in Fungi were my grandparents, on both sides. All four were of Polish descent and immigrated to the US in the early 1900's. A few of the ethnic things they brought over with them, was their knowledge of mushrooms, their Ol' wives' tales and their remedies/ointments. By the time I arrived on the scene, they had found their favorite picking spots for edible mushrooms including their favorite, "Podpink". This is the eastern European mushroom nick-named the "Honey Mushroom" or in Latin, *Armillaria*, a complex of species. They taught me how, when and where to find bushel baskets full of these things. Then they had to be taken back to the cottage and be processed, which took hours to clean, separate, cook, freeze, thread with string and dry. What a great time in my life, and thank God I retained the knowledge. I am passing it down to my children as best I can.

Thanks to my family and friends who supported me and put up with me and my attitude for months, while I was writing this book, and simultaneously facing a layoff from IBM, for many months straight. Then I got the axe on Nov.15, 2002.

A Special thanks to my wife Cheryl. As a Registered Nurse, she provided me with a lot of

medical knowledge about health related symptoms due to Molds.

The hummingbirds and other wildlife at my Summer lakeside camp at Guestward-Ho Campground, in the high mountains of South Central NY, where most of this book was written, provided me with many hours of entertainment, during the Spring, Summer and Fall of 2002.

Thanks to all the public information available, Instructors, Lecturers, Scientists, Mycologists, Biologists that I have met and personally learned from, and all the other professionals like David Fischer, who presented many subjects at many Mushroom Forays sponsored by clubs such as NAMA, NEMF, SVMS and others. Mold Specialists Edward Hemway and Phillip Fry, also made a big difference in the way I look at Mold today. Their Mold knowledge is uncanny, keep teaching!

Thanks to John Haines (NYS Sr. Scientist) for taking the time to review this Book for its technical content on airborne particulates.

Thanks to David Fischer, Mycologist, Author and friend. David gave me a lot of guidance and we had many discussions in his music room.

Thanks to Roy Reehil, a mycophile for his expertise and partnering with me on this book.

Thanks to Melinda Ballard (Executive and Mold Activist) for looking at this Book from her personal experience point of view with Toxic Black Mold.

Thanks to Laura Nelson (English Teacher for the Johnson City School district) who took a lot of time to review this Book for grammar and composition. She made this publishable

Thanks to Art Bell, Coast to Coast late night radio and Dreamland. I listened to them for many

hours while writing this book. Their hosts, guests, stories, content and discussions kept me up to sometimes until 5am, when they finally went off the airwaves. Happy retirement Art! I will miss your late night voice!

Good Luck George Noory with Coast to Coast AM in 2003 & BEYOND! Hopefully we will be discussing this issue some night to help your millions of listeners combat Mold, the most rapid growing biohazard in the 21st Century.

About the Author

All the information in this book is a collection of what I have learned about Mold and its effects on man. Being around Fungi for almost all my 50 years of life has opened up many new doors. I never thought that a certain Fungus could heal all sickness or be a panacea, but I have learned that certain Molds can be very problematic to many people with their health in their homes, schools and workplaces.

I have been married to my wife Cheryl for 28+ years, have 3 children, Rich, Shelly and Gary. I hold 2 Patents, have 10 Inventions and a dozen Technical Papers published on Mechanical Engineering and Manufacturing Processes.

My 30+ years in an Engineering background, associations and acquaintances with many fungal professionals, my being president of the Susquehanna Valley Mycological Society for years, my Certification as a Mold Inspector and the knowledge that I have gained, provide me with the right skills to analyze this Mold issue, which is in its infancy. This book provides the latest views and facts and is intended to be a comprehensive book that looks at the Toxic Black Mold hysteria and Molds in general without getting too technical. This is not a textbook and no endorsements have been made.

I do now, and have had in the past, access to many of the most noted Scientists, Biologists and Mycologists in North America. I learned a lot from the best in the Mycological field. All of the information in this book is public knowledge and can be found in any

number of places. You just have to dig very deep for many years to find what you want to know and ask the right questions to the right people.

Knowledge is the key in controlling Mold and Mold Spores. This book is loaded with fungal facts, which I have learned, and if needed, it should save you time and money.

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Preface

Indoor Toxic Black Mold A Real Problem or Just Hype?

After reading this book you'll be able to make
your own decision !

The following information should provide the reader with enough information and facts to make intelligent decisions about indoor Mold infestations and the damage they can cause. Do it Yourself ? Or, hire a Mold Specialist to inspect your dwelling and provide professional answers to your Mold questions? Any Mold found indoors (Home, Office, School, etc...) should be properly Remediated immediately! All good Mold specialists agree, no indoor Mold is good Mold!

Are we fighting an Enemy that we sometimes can't see? Are Mold Spores Man's greatest Enemy and also our Best Friend? Is Mold a Competitive Species that wants to eat your house, and make you sick? Can a professional Mold Inspector provide information on the condition of your Home? The answer to these questions may surprise you.

Any Mold found should be identified prior to removal. An inexperienced individual who removes Mold without doing some "homework" first, can make matters much worse. Depending upon what kind of Mold has infested an area and how badly the Mold has progressed in its growth, dictates the Protocol Plan and Remediation techniques. Most indoor Molds are not Toxic and can be removed with normal "good practice" cleaning methods and common sense.

Many people who are susceptible to respiratory health problems may very well have reactions to Molds/Mold Spores. Are you willing to accept the potential health risks for you and your family or tenants, if you do not know what type of Molds you have inside of your house/dwelling, or how bad your infestation is? Making an error on the side of caution is the prudent way to approach Mold problems. Making errors due to ignorance or lack of knowledge can potentially cost you and your loved ones your good health and/or your homes.

If you have a MUSTY smell in any area of your house, you probably have Mold somewhere. Don't ignore one of the first warning signs. Do something about it.